Truck Scales

Map Code: 28 and 28A, Plate II-1
Status: existing -   28:3rd quarter 1976
                       28A: 4th quarter 1989

Both truck scales consist of a standard highway scale unit of a size and capacity suitable for weighing medium duty highway coal trucks. Also associated with each scale is a small metal building in which the controls and read-out are located. The scales weigh the trucks before and after loading to determine the tonnage of coal being sold. They are calibrated and certified by the State at least once each year. The truck scales are located within the approved surface drainage control area.

Explosives Storage

Map Code: 29, Plate II-1
Status: existing - prior to 1975

The explosives storage consists of a prefabricated, skid-mounted sheet metal box measuring approximately 6 feet on a side. It is equipped with a heavy steel door and a lock guard. The explosives magazine is presently located near the scrap yard.

The Emery Mine does not currently use explosives for coal production: however, explosives are used from time to time for special projects. Therefore, only a minimal amount is in storage at a given time.

The explosives storage meets MSHA guidelines and is contained within the surface drainage control area.

Sewage Treatment System

Map Code: 32, Plate II-1
Status: existing - 4th quarter 1975

The mine sewage system consists of a 13,500-gallon septic tank, a pump system, and a 30,000-ft^2 leach field. The design capacity of the system is 13,500 gallons per day, The system now processes about 7,000 gallons of raw sewage per day produced from the bathhouses and the office/warehouse. The system was approved for construction by the Utah State Department of Health on September 22, 1975.

Bridge on Quitchupah Creek

Map Code: 33, Plate II-1
Status: existing - 3rd quarter 1979

The bridge on Quitchupah Creek is constructed of a multiplate arch on a concrete foundation with concrete wingwalls and is equipped with guardrail. It is designed to pass 2,230 cfs of water. The bridge was installed to allow access to the stockpile area south of Quitchupah Creek. It replaced two 3-foot-diameter culverts which were determined to be undersized for design flood conditions. This structure was approved for construction by the Utah State Division of Oil, Gas, and Mining on March 19, 1979.

Non-Coal Waste Storage Area
Map Code: 34. Plate II-1
Status: existing - prior to 1975

The non-coal waste storage area consists of two small pits dug into the side of the hill in the stockpile area south of Quitchupah Creek. The pits measure approximately 20'x40'x10'.

Waste materials such as trash, timbers, and cement blocks are hauled from the mine and temporarily stored in the two waste pits. Periodically, the material is loaded onto coal trucks and hauled to a private landfill which is not controlled by Consol.

The pits slope into the hill so that surface water entering the pit is contained. The storage area is within the approved surface drainage control system.

Coal Stockpile Areas/Coal Mine Waste Area
Map Code: 31, Plate II-1
Status: existing - lower piles prior to 1975
          - northwest pile 3rd quarter 1982

The CROM product is discharged into a "live" storage pile at the tipple, where it is either loaded immediately onto trucks with a front-end loader or shuttled to a stockpile.

The mine has three static stockpile areas. The "upper" stockpile, located north of Quitchupah Creek in the mine yard, has a maximum capacity of 25,000 tons. The "lower" stockpile is located south of Quitchupah Creek and has a storage capacity of 20,000 tons. The third stockpile is northwest of the mine office near the mine entrance gate. This area is located in the southern portion of area 31. This pile has a capacity of 150,000 tons and is used to handle excess mine production during times of decreased near term coal sales. Under normal operating conditions, approximately 15,000 tons of combined products are stockpiled at any time, with a monthly stockpile flux of about 5,000 tons. This allows adequate surge capacity but eliminates the problems of stockpile fires and the expense of rehandling.
        The existing Coal Mine Waste Disposal Site is located in the northern portion of area 31. This pile will remain active for the life of mine. This pile has an active MSHA Coal Refuse ID No.1211-UT-09-00079-01. The MSHA permit granted an initial exemption from the 2 foot compaction requirement, and allows for only lateral extension of the pile in 2 foot compacted lifts in the future. The additional underground development waste that will be placed on the pile will come from future U/G overcast development. The volume will not exceed 600 cu.yds.,and will be sampled for acid/toxic parameters and included in the annual report. This will bring the capacity of the Coal Mine Waste Pile to 37,600 cu.yds. The material will be placed in less than 2 foot lifts and compacted per 30 CFR Part 77.215. This material will be moved to the Proposed Permanent development waste disposal site within 12 months after cessation of mining.

All of the stockpile areas are contained within the approved surface drainage control system. Refer to CH VI App VI-6 for drainage design for the coal mine waste pile. Refer to CH II, pg 20 and CH V Section V.A.4 for a discussion on roof and floor characteristics (underground development waste) and Section V.A.5 for a discussion of acid, alkaline, toxic potential. Also refer to CH VI section VI.2.8.3 (PHC) for a similar discussion. Refer to CHIV pg. 21 for waste characterization of the original material, and CH IV, App IV-9 for current analysis.

Revised 2/08

Permanent Underground Development Waste Disposal Site

Map Code: identified by name, Plate II-1
Status: Proposed

Underground development wastes currently stored on the northwest coal stockpile site and any new development wastes generated will be permanently buried in this disposal site. This disposal area is a 4.32.1 acre site located at the gravel borrow pit on the hilltop, east of the northwest coal stockpile area. A complete description of this disposal site is given in this part under UMC 784.19, with design information located in Chapter IV. Post mine drainage of this area can be found at CH VI, App. VI-7.

Parking Area

Map Coder 35, Plate II-1
Status: existing - prior to 1975

The employee parking area is located near the office and bathhouses and provides ample space for employees and visitors. The parking area is within the approved surface drainage control area.

Mine Yard Roads
Map Code: 36, Plate II-1
Status: existing - prior to 1975

The mine yard road system is comprised of four (4) sections. Two (2) are Class I roads and two (2) are Class II roads. The first section, a Class I road, begins at the mine gate and ends at the warehouse office building. Section 2, a Class II road, branches off of section 1 and accesses the storage area west of the warehouse/office building. Section 3 is a Class I road which starts at the mine yard and accesses the coal storage area south of Quitchupah Creek. This section crosses an approved bridge over the Creek. Section 4, a Class II road, is located between the tipple stockpile and the ventilation fan building. As-built cross sections for the Class I roads are contained in Chapter IV

All of these roads are within the approved surface drainage control area and are periodically watered down during dry weather to prevent fugitive dust.

Mine Rescue Storage Area

Map Code: 37, Plate II-I
Status: existing - prior to 1975

This structure is a utility trailer parked in the mine yard. It is used to provide mobility for the mine rescue equipment in the event that it (and the mine rescue team) is needed elsewhere. This unit is contained within the approved surface drainage control system.

UMC 784.13(b)(7), UMC 817.89

Non-coal waste materials, which may be acid-forming, toxic-forming, or a fire hazard, are temporarily stored in a small area (approx. 800 ft^2) dug into the side of the hill in the area south of Quitchupah Creek. This storage area is coded 34 on Plate II-2. The materials are then hauled to a private landfill which is not controlled by Consol.

This containment area is not within eight (8) ft. of a coal outcrop or coal storage area. Fires are prevented and would easily be detected and extinguished if they did occur. Fire hydrants and extinguishes are located at key positions around the surface facilities area. The area is within the approved surface drainage control system.

UMC 784.19, UMC 817.71-.74

EXISTING COAL MINE WASTE DISPOSAL SITE

The existing Coal Mine Waste pile is located in the northern portion of area 31, Plate II-1. This pile will remain active for the life of mine. This pile has an active MSHA Coal Refuse ID No.1211-UT-09-00079-01. The MSHA permit granted an initial exemption from the 2 foot compaction requirement, and allows for only lateral extension of the pile in 2 foot compacted lifts in the future. The additional underground development waste that will be placed on the pile will come from future U/G overcast development. The volume will not exceed 600 cu.yds.,and will be sampled for acid/toxic parameters and included in the annual report. This will bring the capacity of the Coal Mine Waste Pile to 37,600 cu.yds. The material will be placed in less than 2 foot lifts and compacted per 30 CFR Part 77.215. This material will be moved to the Proposed Permanent development waste disposal site within 12 months after cessation of mining.

PERMANENT DEVELOPMENT WASTE DISPOSAL SITE

A Permanent Development Waste Disposal Site disposal site for underground development waste will be constructed on the hilltop adjacent to the northwest coal stockpile. The area has been disturbed previously by removing a gravel subsoil layer for use as fill material outside the mine area and more recently for the base of the coal stockpile. This created borrow pits on both sides of the access road.

The 4.3 2.1 acre site will be developed in two stages, with the area south of the road used first. The existing pit will be enlarged by removing gravel down to the underlying blue gate shale, if necessary, to provide sufficient storage volume. The excavated material will be stockpiled on the north side of the road to be used as non-toxic cover material over the waste, Any excess excavated material will be placed in the bermed depression on the west side of the office-warehouse building.

A safety berm will be constructed on the south side of the access road as the pit advances toward the road. The road will be temporarily relocated to the north to allow for disposal underneath. It will be returned to its original location and grade after that part of the disposal site is filled. The north portion of the site will then be developed.

Initially, the site will be used to bury wastes presently stored on the northwest coal stockpile base. Wastes will be placed and compacted using tracked and rubber tired equipment. Reclamation will be conducted as described in Chapter III, Drainage for the site is controlled by existing sedimentation ponds, Refer to CH VI. Design details and site surveys are contained in Chapter IV.

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UMC 784.13(b)(1), UMC 784.16(a)(2)(iv),
UMC 784.16(a)(3)(iv)

The following reclamation schedule forecasts the timing of reclamation activities at the Emery Mine. The schedule is based on the assumption that mining will continue through the year 2015~~0~~.

Contemporaneous Reclamation

1st Half, 1982	Reclaimed sections of road to Pond No. 1 and Pump #1
1986	Reclaimed old abandoned mine portal and associated borrow area for backfill.

Final Abandonment

~~2nd - 4th Qtr. 1991~~ 12 months after cessation of use Reclamation of development waste disposal site after wastes stored on the northwest coal stockpile area are buried.

~~1991 - 4th Qtr., 2010~~ 12 months after cessation of use ~~Ongoing r~~Reclamation of development waste disposal site if~~as~~ newly generated wastes are disposed.

~~2nd - 4th Qtr., 1991~~ 12 months after cessation of use Reclamation of disposal site for excess cut material generated from initial development of the waste disposal site.

~~1992 - 4th Qtr., 2010~~ 12 months after cessation of use ~~Ongoing R~~reclamation of disposal site used for excess cut material.

From Construction - Ongoing reclamation of ~~4th Qtr., 2010~~ proposed coarse refuse disposal site following construction of this facility as newly generated wastes are disposed.

Final Abandonment

~~1st - 4th Qtr. 2011~~ 12 months after cessation of use Removal of all non-earthen structures.

~~1st - 2nd Qtr. 2012~~ 12 months after cessation of use Surface debris removal, regrading, final covering of excess spoil and development waste disposal sites, final covering of coarse refuse disposal site. Dewater freshwater cell of slurry pond, removal of Ponds No. 1, No. 4, and No. 6 and embankments, sealing of mine openings, backfilling and regarding, removal of culverts and bridges, regarding roads and parking areas, topsoil respreading.

Revised 2/08

3rd - 4th Qtr. 2012~~12 months after cessation of use~~Seedbed preparation and seeding, fertilization, mulching, and erosion control.

~~2nd - 3rd Qtr. 2013~~12 months after cessation of useErosion control and reseeding.

~~1st - 2nd Qtr. 2014~~12 months after cessation of useRegrade, respread topsoil and revegetate remaining surface water control facilities and slurry pond.

The following reclamation schedule forecasts the timing of reclamation activities at the 4th East Portal Site. Reclamation is anticipated to begin upon final removal of underground machinery.

Year	No. Work Days	Description of Reclamation Work
1	21	Seal Underground Entries and Backfill - 3 Entries - MSHA Approved Seals
1	30	Removal of Surface Structures (conveyor, bins, scales, screens/crusher, fan)
1	5	Removal of Footers and Foundation (concrete and/or steel)
1	5	Pick-up coal stockpile and place in bottom of boxcut opposite side of U/G entries.
1	2	Clean-out Sediment pond - place sediment in boxcut
1	60	Backfill boxcut & Lower Pad Area. Backfill to be placed in no more than 3 foot lifts. Material to be compacted with traversing of heavy equipment.
1	5	Backfill Air Shaft - Non-toxic material
1	2	Remove gravel from site - use as backfill material in airshaft.
1	10	Restoration of Ephemeral Stream approx 500 feet.
1	2	Respread Berm Material
1	2	Construct Silt Fences and/or other alternate sediment control (Temporary)
1	5	Placement of Rock Structures along Stream Restoration
1	6	Respread & Roughen Topsoil
1	2	Seed & Mulch Affected Surface
2 & 3	2	Refill Air Shaft
2	3	Backfill of Temporary Diversion approx 500 feet.
2	3	Respread & Roughen & Seed & Mulch Topsoil of Temp. Diversion
4	5	Place Permanent Concrete Cap and Monument Marker
6	3	Remove Sediment Basin #9 Backfill & Topsoil
6	2	Install silt Fence downstream toe of basin #9 removal
6	2	Seed & Mulch Basin #9 and Topsoil Pile Location
7	2	Remove Alternate Sediment Control (silt fence, straw bales, check dams)

Reclamation of the permanent underground development waste disposal site and excess cut material site will be initiated as soon as all the material presently being stored at the northwest coal stockpile area (Existing Coal Mine Waste Disposal Site) is placed in the permanent underground waste disposal site. During excavation of the initial disposal site, excavation material will be stockpiled to provide four (4) feet of non-toxic material to cover the wastes. Based upon differences in soil quality, the cover material will be segregated into two stockpiles. One stockpile will be designated as a subsoil stockpile and the other will be designated as a topsoil stockpile. These stockpiles will be independently bermed and contemporaneously revegetated. Excess cut material will be conveyed and placed in a bermed depression west of the office building. After the existing coal mine temporarily stored wastes isare placed in the permanent underground development waste disposal site, the wastes will be covered with subsoil and topsoil, and revegetated. The remaining portion of the disposal site will be developed and reclaimed in a similar manner on an as-needed basis as additional underground development wastes are generated. In order to reclaim the active portion of the site, sufficient cover material will be maintained in stockpiles adjacent to the active area. Temporary stabilization will be established by broadcasting the native seed mix described in Chapter VIII.C.3 :

Permanent cover will be established by utilizing seed mix A (mixed desert shrub) as described in Chapter III.F.1 and Chapter VIII.C.4. Additional detail concerning backfilling and grading of these sites may be found in Chapter III.C.1. The soil quality and design parameters for the disposal site are described in Chapter VII - Appendix 2 and Chapter IV.C.1. respectively.

Contemporaneous grading will be conducted at the coarse refuse disposal site as the refuse is deposited. As the refuse disposal bank is constructed, grading will be conducted on the lower face to insure stability and maintain the design slope (2.5H to 1V). A small 25 foot wide terrace will be constructed above each grade lower face to control drainage. In addition, grading will be conducted on all lower faces to repair any gullies which occur during the life of the facility. The slurry impoundment is projected to be constructed in conjunction with the coarse refuse disposal site construction. Therefore, the slurry impoundment borrow area shown on Plate III-3 will be contemporaneously reclaimed as described in Chapter III.C.1. The borrow area will be jointly reclaimed with the contemporaneous grading of the coarse refuse disposal site within one (1) year of the construction of these two (2) facilities. Upon final cessation of active use, the final grading and backfilling as described in Chapter III.C.1 will be completed according to the reclamation schedule. Topsoiling and revegetation will be completed as described in Chapter III.E.1 and Chapter III.F.1. Additional detail concerning the design parameters and drainage control can be found in Chapter IV.C and Chapter VI.C respectively.

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Revised 2/08

III.B.1 STRUCTURE REMOVAL AND SITE CLEANUP

UMC 784.11(b), 817.132

All surface structures at the mine will be removed or razed upon either the completion of mining or after the useful life of these facilities has expired. The structure that are salvageable will be sold and removed; all other structures will be razed and disposed of in an environmentally sound manner. ~~Wherever possible, the inert and sound refuse will be utilized as backfill.~~ Please refer to Plates II-1, II-2, II-3 and Chapter II.A for the location and description of existing and proposed facilities at the Emery mine.

Prior to regarding the affected surface areas, surface debris (coal fines, pavement material, etc.) will be removed. The material that is removed ~~will be deposited in the abandoned underground mine workings and sealed from outside exposure or will be buried at another suitable location. It is possible that portions of the facilities utilized for coal handling and storage areas will be covered with coal fines. If the coal fines occur at a depth of less than four (4) feet, the fines will be removed to the original surface and~~ will be disposed in the permanent underground development waste disposal site ~~abandoned underground workings under a disposal~~ plan developed at that time and approved by MSHA and DOGM, or sold as product. If the proposed coarse refuse disposal area has been constructed prior to completion of underground mining, the coal fines may be disposed of in that facility prior to commencing final reclamation of the disposal area.

~~In areas where coal fines exist in depths greater than four (4) feet, coal will be removed to a depth of four feet and the excavation will be backfilled with material from the road embankments or excess cut material from the Underground Development Waste Disposal Site. The coal fines which are removed will be disposed of as previously described. Placement of four (4) feet of fill without excavation of any existing coal fines may be utilized to blend with the surrounding landscape and restore natural drainage patterns. These methods will be utilized in all areas where coal fines exist in depths greater than four feet unless testing shows that less fill material can be utilized as cover.~~

UMC 784.23(b)13, 817.56

There are currently no existing facilities which will remain as permanent features upon cessation of underground mining activities. In addition, there are no existing facilities proposed as permanent. Therefore, no renovation of these structures will be required prior to final bond release. For details of the reclamation of these structures please refer to Chapter III.C.1 and III.D.1.

Revised 10/2002
Rrevised 2/08

UMC 817.71-817.74, UMC 817.81-817.88, UMC 817.91-817.92, 817.103

No acid-forming or toxic-forming materials are expected to be encountered during the reclamation of the surface facilities. However, if any of this type of material is encountered, it will either be placed in the permanent underground development waste site or disposed of in the abandoned underground mine workings under a disposal plan developed at that time and approved by MSHA and DOGM. If the proposed coarse refuse disposal area has been constructed prior to completion of underground mining, the acid or toxic forming materials may be disposed of in that facility prior to commencing final reclamation of the disposal area.

~~In lieu of the above methods, a minimum of four (4) feet of fill may be utilized to cover acid-forming and toxic-forming materials in place unless testing indicates that less fill material may be utilized as cover. This method will only be used if the toxic-forming material is not in close proximity to a drainage course and the resulting topography will blend in with the adjacent land. If fill material is utilized as cover, the material will be placed in lifts that will not exceed two (2) feet which will insure proper compaction and avoid leaching into surface or groundwater.~~

All toxic-forming or acid-forming material will be disposed of by the above methods within thirty (30) days after first being exposed on the mine site. However, temporary storage of these materials, in accordance with UMC 817.48(c), in excess of thirty (30) days may be requested if immediate burial or treatment is not feasible and will not result in any material risk of water pollution or other environmental damage.

Underground development wastes currently located at the ~~temporary existing~~ coal mine ~~waste stockpile~~ site and any future development wastes will be buried in the Permanent Underground Development Waste Disposal Site shown on Plate II-1. When the coarse refuse disposal area has been constructed, underground development wastes will be disposed of in that site. Reclamation of the Underground Development Waste and Excess Cut Material Disposal Sites will be done contemporaneously as described in Chapter III.A.2. The development wastes will be covered with four (4) feet of non-toxic material and graded to approximate pre-disturbance contours. Since the area was previously disturbed prior to August 3, 1977, no original cover material is available. Use of sand and gravel deposits which will be stockpiled during construction, will provide a material better than the pre-disturbance soils for establishing vegetation. For additional information on soils, please refer to Chapter III.A.2 and Chapter VII Appendix 2. The excess cut material from this site will be placed in the bermed depression west of the office. Sideslopes will be maintained at 3H:1V. For additional detail concerning design and volume calculations, cross sections, and plan views of these two sites (Underground Waste and Excess Cut material disposal sites) please refer to Chapter IV.C.1. Seed mixes for temporary and permanent cover will be utilized as described in Chapter III.A.2.

Final reclamation of the proposed coarse refuse disposal site will commence upon final abandonment of the site. Contemporaneous reclamation of this facility will be conducted as described in Chapter III.A.2. Final reclamation will consist of final grading to achieve the final postmining contour as shown on Plate III-7. After completion of final grading, a minimum of four (4) feet of non-toxic material will be placed on the exposed facility unless testing shows that less fill material may be utilized as cover. Cover material will be available from the excavated material stockpiled during the construction of the slurry impoundment. For additional detail concerning the materials balance and design information for this facility may be found in Chapter IV.C.2. The location of this structure is shown on Plate II-2.

Following completion of mining, the slurry refuse ponds and freshwater cell will be allowed to dry. The freshwater cell will be pumped down and discharged into Pond 001 prior to reclamation of Pond 001. After the refuse ponds have been allowed to dry (anticipated time for drying is from two (2) to four (4) years), the refuse dike and slurry will be graded into the freshwater cell. Grading will be conducted to achieve an average uniform final slurry elevation of 5942

CHAPTER IV

ENGINEERING DESIGNS

CHAPTER IV - ENGINEERING DESIGNS

<u>APPENDICES</u>

CHAPTER IV.C   WASTE DISPOSAL

IV.C.1   PERMANENT UNDERGROUND DEVELOPMENT WASTE DISPOSAL AND EXCESS SPOIL SITES

UMC 817.71-.74

Site Description

General

The sites to be used for the disposal of underground development wastes and excess spoil do not involve valley, head-of-hollow or durable rock fills.

The 2.14.3 acre site is situated on a hilltop east of and adjacent to the northwest coal stockpile. Ownership Plate I-1 shows Consol as owner of surface and coal at this site. Property control information shows no deed restrictions for sand and gravel deposits. The site is crossed by a service road that accesses the water tank and substation (See site Map - Plate II-1). The area was disturbed previously when gravel was removed for use in and around the mine site. The area is underlain by abandoned room and pillar mine workings that were mined in the 1940's. Old mine maps show that 40% of the coal has been removed.

Geology

The existing gravel pit exposes quarternary terrace deposits that are crudely stratified and poorly sorted sand and gravels. Maximum thickness for similar deposits in Section 29, T 22S, R6E, is about 40 feet. Plate VI-2 titled Geology of the General Mine Area shows that these alluvial terrace deposits are on top of a layer of Bluegate shale which is above the upper portion of the Ferron sandstone unit which constitutes the roof material in the mine. The overburden is about 70-75120 feet thick. The alluvium and shale layers are isolated from similar strata located to the north.

Hydrology

A survey of the area was made and no seeps or springs were identified. This is consistent with the geological information shown on Plate VI-2. This plate shows springs emanating from terrace deposits located north of the site. These springs are sustained from the irrigation and leaching applications of local farmers using diverted Muddy Creek water. Since the disposal sites terrace deposits are isolated from this system, no communication of irrigation supplied groundwater is possible at the project site. Groundwater movement is further restricted by the relatively impermeable Bluegate shale layer on which the site will be built.

All surface drainage from the site reports to existing sedimentation control structures.

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Revised 2/08

Design Considerations

~~Volume calculations taken from cross sections of the site are listed below.~~ Representative cross sections of the permanent waste disposal site are found on Plate IV-4. The cross sections are drawn to show both existing and final surface profiles in addition to a four foot cover area. A plan view of the site showing proposed reclaimed contour lines is also found on Plate IV-~~5~~4.

~~The site will be developed in two basic phases with initial work beginning in the area south of the service road. The area under and north of the road will be developed as needed. Volume calculations have been broken out to reflect this two site approach.~~

~~VOLUMES~~ ~~(In Cubic Yards)~~			
	~~South of Road~~	~~North of Road~~	~~Total~~
~~Total Capacity~~	~~21,600~~	~~12,550~~	~~34,150~~
~~Waste Capacity~~	~~13,700~~	~~8,150~~	~~21,850~~
~~Cut Material~~	~~19,900~~	~~12,550~~	~~32,450~~
~~Cover (4 ft.)~~	~~7,900~~	~~4,400~~	~~12,300~~
~~Excess Cut Material~~	~~12,000~~	~~8,150~~	~~20,150~~

The site will be developed by removing all in-place soil above an elevation of 5980 feet, with the eastern boundary of the disposal area cut at a slope of 1.5H:1V. The refuse at the existing coal mine waste disposal site will then be placed in the permanent location in 12-inch lifts and compacted to 95% of Proctor density. Appendix IV-9 indicates that the existing waste has an average in-situ density of 71 lb/ft^3. Prior to moving to the permanent disposal site, this waste will occupy a volume of 37,600 yd^3 (36,040 tons). With an average Proctor density of 99 lb/ft^3 (see Appendix IV-9), this material will occupy a volume of 28,400 yd^3 if compacted at 95% of Proctor density. Four feet of cover soil will be placed over the compacted waste and the site will be revegetated.

Approximately 97,130 yd^3 of soil will be excavated to create the permanent coal mine waste disposal site. The permanent waste disposal site shown on Plate IV-4 can accommodate 57,640 yd^3 of waste and cover soil. As indicated above, the waste will occupy 28,400 yd^3. With 28,710 yd^3 of soil cover, the total quantity of material being placed in the permanent disposal site will equal 57,110 yd^3 (slightly less than the available quantity). The excess soil removed from the permanent waste disposal site will be used for reclamation of other disturbed areas at the mine.

The final contour of the underground development waste disposal site is designed to ~~achieve the approximate original contour~~drain to the locations of Ponds 5 and 8, as indicated in Appendix VI-7. ~~This will enhance the existing gravel pit by ensuring that reclamation will be compatible with the natural surroundings. The design eliminates any depressions or impoundments on the completed fill.~~

The disposal area will utilize ~~2.1~~4.3 acres, all ~~with 1.3 acres~~ draining south toward Pond 8 ~~of the service road and 0.8 acres under and north of the service road. The structure will be excavated to a maximum depth of 15 feet.~~ The wastes will be placed in a controlled manner in order to increase the stability of the fill.

The stability will also be enhanced because:

1) The design requires that most of the wastes be buried in an incised structure,

2) The site has moderate existing slopes,

3) Cross sections of the proposed final reclaimed site show that slopes will not exceed 20%, therefore no keyway cuts or rock toe buttresses should be needed,

4) The fill will be hauled and placed in horizontal ~~two~~ one foot lifts and concurrently compacted as necessary to prevent mass movement,

5) Abutment slopes will be ~~2h~~1.5h:1v.

IV.C.4   EXISTING COAL MINE WASTE DISPOSAL SITE

UMC 817.71-.74

Site Description

General

This site is used for storage of coal mine waste and does not involve valley, head-of-hollow or durable rock fills. Refer to CH IV.C.4 Fig 1 for detail.

The storage area is located on a previously approved coal stockpile area (CH II Map code 31, Plate II-1) sometimes referred to as the northwest coal stockpile area throughout the MRP. Ownership Plate I-1 shows Consol as owner of surface and coal at this site. The site is crossed by a service road that accesses the water tank and substation (See site 31 Map - Plate II-1). The area is underlain by abandoned room and pillar mine workings that were mined in the 1940's. Old mine maps show that 40% of the coal has been removed, with no secondary pillar extraction. The pile contains approximately 37,000 cu. yds. of material, and the mine anticipates adding approximately 600 cu. Yds in the future. The existing Coal Mine Waste Disposal Site has an existing MSHA Coal Refuse ID No. 1211-UT-09-00079-01. The MSHA permit granted an initial exemption from the 2 foot compaction requirement, and allows for lateral extension of the pile in 2 foot compacted lifts per 30 CFR Part 77.215. Consol intends to classify this site as the active Coal Mine Waste Disposal Site and continue to add to it if needed until the mine begins final reclamation. Final reclamation of the existing Coal Mine Waste Disposal Site will follow the previously approved reclamation plan as outlined in CH III. The Existing Coal Mine Waste Disposal Site will be placed in the Permanent Underground Development Waste Site (See site 9 Map - Plate II-1) during final reclamation.

Geology

Plate VI-2 titled Geology of the General Mine Area shows this area to be near the top of a layer of Bluegate shale which is above the upper portion of the Ferron sandstone unit which constitutes the roof material in the mine. The overburden is approximately 120 feet thick. The shale layers are isolated from similar strata located to the north.

Hydrology

A survey of the area was made and no seeps or springs were identified. This is consistent with the geological information shown on Plate VI-2. This plate shows seeps emanating from terrace deposits located north of the site. These seeps are sustained from the irrigation and leaching applications of local farmers using diverted Muddy Creek water. Since the disposal sites terrace deposits are isolated from this system, no communication of irrigation supplied groundwater is possible at the project site. Groundwater movement is further restricted by the relatively impermeable Bluegate shale layer on which the site will be built.

Inserted 2/08

All surface drainage from the site reports to existing sedimentation control structures (see CH VI, Pond 8 design).

Slope Stability Analysis

Please refer to CH IV Appendix IV-9 for slope stability analysis of the Existing Coal Mine Waste Disposal Site. Based on this report the existing coal mine waste disposal site conforms to the stability criteria mandated by R645-301-536-110, and 120. All slopes have a factor of safety of at least 1.5. The area is underlain by abandoned room and pillar mine workings that were mined in the 1940's, and old mine maps show that 40% of the coal has been removed, with no secondary pillar extraction. This mining method did not contemplate subsidence and the low recovery ratio and pillar size would indicate that the foundation will remain stable.

MINE ENTRANCE ROAD

EXISTING COAL MINE WASTE PILE

COAL STOCKPILE AREA

PROPOSED LOCATION FOR FUTURE COAL MINE WASTE (600 yd^3)

A

B

C

A'

B'

C'

5960

5970

5980

5990

5955

5988

5975

E.1,708,500

N.6,754,000

EXISTING TOPSOIL STOCKPILE T-2

NOTE:
SEE CHAPTER II.A ITEM 31 FOR DISCRIPTION.

0'

100'

Section A–A'

HORZ. SCALE: 1'=100'
VERT. SCALE: 1"=50'

COAL MINE PILE

EXISTING GROUND

6005
5980
5955
5930

0   200   400   600

Section B–B'

HORZ. SCALE: 1'=100'
VERT. SCALE: 1"=50'

COAL MINE PILE

EXISTING GROUND

5990
5940

0   200   400

Section C–C'

HORZ. SCALE: 1'=100'
VERT. SCALE: 1"=50'

COAL MINE PILE

EXISTING GROUND

6005
5980
5955

0   200   300

CALCULATED VOLUME   = 37,000 yd^3 AS OF 11/07

PROPOSED ADDITIONAL   =   600 yd^3 (PRIOR TO MINE CLOSURE)

TOTAL VOLUME   = 37,600 yd^3 (POTENTIAL)

CHAPTER IV.C4 FIGURE 1.
EXISTING COAL MINE WASTE PILE
PLAN AND CROSS-SECTIONS

Bonding Calculations

Direct Costs

Subtotal Demolition and Removal	$205,764.00	
Subtotal Backfilling and Grading	$1,251,465.00	
Subtotal Revegetation	$510,251.00	
Direct Costs	$1,967,480.00	

Indirect Costs		
Mob/Demob	$196,748.00	10.0%
Contingency	$98,374.00	5.0%
Engineering Redesign	$49,187.00	2.5%
Main Office Expense	$133,789.00	6.8%
Project Mainagement Fee	$49,187.00	2.5%
Subtotal Indirect Costs	$527,285.00	26.8%

Total Cost	$2,494,765.00	

Escalation factor		0.012
Number of years		5
Escalation	$153,322.00	

Reclamation Cost Escalated	$2,648,087.00	

Bond Amount (rounded to nearest $1,000)	$2,648,000.00	
2009 Dollars		

Bond Posted 2004 dollars	$2,208,000.00	

Difference Between Cost Estimate and Bond	-$440,000.00	
Percent Difference	-16.62%	

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Backfill and Grade Portal Area 01															151964
Coal Fines Removal 02															111793
Excavate Permanent Coal Mine Waste Site 03a															280799
Place and Cover Coal Mine Waste 03															165153
Roadside Berms 04															6696
Dike Improvements 05															12984
Pond No One 06															76897
Pond No Two 07															12984
Pond No Three 08															1420
Pond No Four 09															15014
Pond No Five 10															6291
Pond No Six 11															37535
Pond No 1 Road 12															608
Pump No 1 Road 13															811
Tank Road 14															811
MineYardRoads15															7711
The 4th East Portal 16															361994
Total															1251465

Emery Deep Mine
Backfilling and Grading
Place and Cover Coal Mine Waste 03

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
627F EROPS (9-40) (3Q02) 2000	15200	75.5	0.1	50.7	228.75	6	1372.5	$/HR	57110	CY	702	CY/HR	81.4	HR	111722
D7R Semi-U (9-43)(3Q02) 2001	10335	35.55	0.1	50.7	154.4	1	154.4	$/HR					81.4	HR	12568
D8R Series II Semi-U EROPS (9-43) (3Q02)	13620	47.7	0.1	50.7	188.3	1	188.3	$/HR					81.4	HR	15328
12H EROPS (9-1)(3Q03)	5205	20.7	0.1	50.7	106	1	106	$/HR					81.4	HR	8628
5,000 gal H2O truck Diesel (20-6) (2Q03)	4855	27.95	0.1	40.3	101.39	1	101.39	$/HR					81.4	HR	8253
Pickup Truck Crew 4x4 1 ton (20-7) (2Q03)	875	4.45	0.1	0	10.36	1	10.36	$/HR					81.4	HR	843
CLAB					40.5	1	40.5	$/HR					81.4	HR	3297
Foreman Average, Outside					55.45	1	55.45	$/HR					81.4	HR	4514
Subtotal															165153

Emery Deep Mine
Backfilling and Grading
Excavate Perm Coal Mine Waste Site 03a

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
627F EROPS (9-40) (3Q02) 2000	15200	75.5	0.1	50.7	228.75	6	1372.50	$/HR	97130	CY	702	CY/HR	138.4	HR	189954
D7R Semi-U (9-43) (3Q02) 2001	10335	35.55	0.1	50.7	154.4	1	154.40	$/HR					138.4	HR	21369
D8R Series II Semi-U EROPS (9-43) (3Q02)	13620	47.7	0.1	50.7	188.3	1	188.30	$/HR					138.4	HR	26061
12H EROPS (9-1)(3Q03)	5205	20.7	0.1	50.7	106	1	106.00	$/HR					138.4	HR	14670
5,000 gal H2O truck Diesel (20-6) (2Q03)	4855	27.95	0.1	40.3	101.39	1	101.39	$/HR					138.4	HR	14032
Pickup Truck Crew 4x4 1 ton (20-7) (2Q03)	875	4.45	0.1	0	10.36	1	10.36	$/HR					138.4	HR	1434
CLAB					40.5	1	40.50	$/HR					138.4	HR	5605
Foreman Average, Outside					55.45	1	55.45	$/HR					138.4	HR	7674
Subtotal															280799

EXISTING COAL MINE
WASTE DISPOSAL SITE,
SLOPE STABILITY
AND CHEMICAL ANALYSES,
EMERY MINE

Prepared for

CONSOLIDATION COAL COMPANY
Emery Mine
Emery, Utah

January 2008

Prepared by

EARTHFAX ENGINEERING, INC.
Engineers/Scientists
Midvale, Utah
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No. 168246
RICHARD B.
WHITE

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EXISTING COAL MINE
WASTE DISPOSAL SITE
SLOPE STABILITY AND CHEMICAL ANALYSES,
EMERY MINE

CHAPTER 1

INTRODUCTION

The CONSOL Emery Mine existing coal mine waste disposal site (ECMWDS) is located about 4 miles south of the town of Emery, Utah, and is approximately 0.15 miles northwest of the mine office building (see Figure 1, General Location Map). It has been constructed on a relatively flat area and has been used for several decades. This report presents slope stability and chemical analyses of samples collected from the ECMWDS in November 2007 that show that it conforms to the regulations detailed in Utah Administrative Code R645-301-500.

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CHAPTER 2

METHODS

2.1 FIELD METHODS

Soil samples were collected from the ECMWDS on November 26, 2007 using a hollow stem auger drill rig. Two borings were advanced through the ECMWDS and into underlying native materials. Each boring was located near the center of the pile, with one being located in the area where the pile was tallest and another being located where the pile appears to be thinner. The locations of the drillholes are shown on Figure 2. Cuttings were monitored for changes in appearance and were collected from each distinct material encountered and/or for each 5-foot interval of drilling. A composite sample of cuttings from both drillholes was collected in a 5 gallon bucket for chemical analyses. Furthermore, four "undisturbed" samples of the ECMWDS were collected in 2½ inch diameter brass tubes using a modified California split spoon sampler.

2.2 LABORATORY METHODS

2.2.1 Geotechnical Analyses

Soil samples from the ECMWDS were analyzed by Geotechnical Engineering Group, Inc. (GEG) in Grand Junction, Colorado using the following test methods:

- Unified Soil Classification System (USCS) soil classification (ASTM D2487)
- Natural Moisture Content (ASTM D2216)
- Natural Density (ASTM D2937)
- Direct Shear Test Shear Strength (ASTM D3080)
- Standard Proctor Compaction Test (ASTM D698)

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Natural density, moisture content, and direct shear strength tests were performed on the brass tube samples in order to determine the in-situ properties of the ECMWDS. Standard Proctor tests were performed on disturbed samples (cuttings) so that the optimum compaction density could be compared to the in-situ density as determined from the brass tube samples. Soil classification was also determined using disturbed samples.

2.2.2 Chemical Analyses

Chemical analyses were performed in order to determine the potential for adverse environmental impacts from the ECMWDS as well as to determine its coal ranking. A composite of the cuttings from both holes was taken to SGS North America, Inc. in Huntington, Utah for proximate and ultimate chemical analyses of the coal ranking of the material as well as to measure concentrations of the following analytes:

- Carbon
- Hydrogen
- Nitrogen
- Oxygen
- Sulfur
- Oxygen
- Ash

Additional tests were performed on the ash to determine the concentrations of the oxidized compounds produced by combustion.

A fraction of the bulk chemical analysis sample was sent to Inter-Mountain Labs in Sheridan, Wyoming to determine the following values:
- pH

- Saturation

- Electrical Conductivity

- Wilt Point

- Calcium

- Magnesium

- Sodium (Available and Exchangeable)

- Sodium Adsorption Ratio (SAR)

- Nitrate

- Boron

- Selenium

- Total Sulfur (Acid-Base and Acid-Base Potential)

- Neutralization Potential.

2.3 SLOPE STABILITY ANALYSIS METHOD

2.3.1 Slope Stability Model Overview

Slope stability was evaluated by applying Bishop's Method of Slices to three cross sections of the ECMWDS. As indicated in Figure 2, one cross section extended along the long axis of the ECMWDS (A-A') and the other two cross sections (B-B' and C-C') extended at two locations along the short axis of the ECMWDS. Slope stability analyses were performed on the steep slopes located at the ends of each cross section, where the ECMWDS contacts the existing ground. Since the southern slope of the ECMWDS along cross section B-B' has a grade of approximately 2%, the slope was considered stable and a stability analysis was not performed at this location. The geometry of the ECMWDS was based on a topographic survey performed in November 2007 by Ware Surveying. The underlying native ground surface was taken from aerial topography recorded in 1975 (VTN, 1976). Physical and mechanical properties of the slope materials were taken from the results of the geotechnical analyses.

2.3.2 Description of Bishop's Method of Slices

Bishop's Method of Slices is a commonly used method to determine slope stability that can be used to calculate a factor of safety (FS) against rotational shear failure based on the ratio of moments causing to those resisting failure. A FS of 1.0 would indicate that the driving and resisting forces are equal, and that failure, if it has not already occurred, is likely. A minimum FS of 1.5 is required for all waste rock pile slopes to meet the requirements of Utah Administrative Rule R645-301-536.110.

Bishop's Method of Slices tests various circular failure planes with radii that are centered at various distances above the slope. The FS is derived by calculating the moments of numerous vertical slices within the failing arc of soil about the center of the circular surface. The method applies strength (friction angle and cohesion) and density data for each soil type. The method also accounts for pore water pressures and the presence of a phreatic surface. A diagram of how Bishop's Method of Slices is applied and a derivation of the limit equilibrium equation used to determine the FS is presented in Attachment C. The computer program STABLE for Windows (M. Z. Associates, 2002) was used to perform the numerous calculations required to find the critical failure surfaces and their respective FS values.

2.3.3   Slope Failure Model Condition

The slopes of the ECMWDS were considered to be most susceptible to slope failure after a precipitation and/or snowmelt event that would increase pore pressures within the soil. Thus, the failure conditions for the slope stability models assume a perched phreatic surface along the top of the ECMWDS, resulting in a fully saturated pile. This condition is extremely conservative, since the ECMWDS consists primarily of granular materials and is adequately sloped to allow moisture to drain away. Given their low permeability, the native materials underlying the ECMWDS were assumed to remain unsaturated during slope failure.

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2.3.4   Materials Properties

Material properties required for the slope stability model include the saturated density, the cohesion, and the friction angle of the coal refuse and underlying native materials. The coal refuse was divided into two layers with different mechanical properties, based on the geotechnical analysis results. Material properties for the native materials were conservatively assigned based on engineering judgment. The material properties used in the model are summarized in Section 3.2.

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CHAPTER 3
RESULTS

3.1 SUBSURFACE DRILLING RESULTS

Samples and cuttings collected from the two drillholes indicate that the ECMWDS ranges in thickness from approximately 10 feet in the western portion (drillhole TH-2) to approximately 25 feet in the eastern portion (drillhole TH-1). Logs for each of the drillholes are included in Attachment A. Difficult drilling conditions were encountered shortly after the cuttings changed from coal-bearing materials to tan to brown silty sand. Thus, it was interpreted that the native materials located underneath the ECMWDS consist of weathered bedrock with a thin veneer of residual soils.

3.2 GEOTECHNICAL ANALYSES RESULTS

The materials within the ECMWDS have been classified as silty sand and silty clayey sand according to the USCS. In-situ density and Standard Proctor compaction results suggest that the lower portion of the ECMWDS contains denser coal or coal refuse than the upper portion of the ECMWDS. Direct shear test results also show slightly different soil strength parameters at the two depths within the ECMWDS. The laboratory results of the geotechnical analyses are presented in Attachment B and are summarized in Table 1.

An undisturbed sample collected from drillhole TH-1 at 10 feet deep had an in-situ density of 64.8 pounds per cubic foot (pcf) and an undisturbed sample collected from the same drillhole at 20 feet deep had an in-situ density of 80.0 pcf. The calculated saturated densities for the shallow and deep samples were 93.5 pcf and 99.6 pcf, respectively. The dry densities were 61.5 pcf and 80.0 pcf, respectively. The in-situ moisture contents were 5.3% and 8.7%, respectively.

Standard Proctor Tests (ASTM D698) were performed on samples collected from both drillholes at 0-10 feet below the surface of the ECMWDS and on one sample collected from drillhole TH-1 at 15-25 feet below the surface of the ECMWDS. The average maximum dry density of the shallow samples, as determined by the Standard Proctor Test, was 81.2 pcf with an average optimum moisture content of 12.3%. The maximum dry density of the deep sample, as determined by the Standard Proctor Test, was 117.5 pcf with an optimum moisture content of 12.5%.

Based on Standard Proctor Test results, the material located in the lower portion of the ECMWDS has been compacted to within 68% of the maximum dry density and is within 3.8% of the optimum moisture content. The material located in the upper portion of the ECMWDS and where the ECMWDS is less than 15 feet thick has been compacted to within 76% of the maximum dry density and is within 7% of the optimum moisture content.

Direct shear test results were performed on two undisturbed samples collected from drillhole TH-1 at 10 feet and 20 feet below the surface of the ECMWDS. The friction angles for the shallow and deep samples were found to be 28.9 and 30.3 degrees, respectively. The cohesions for the shallow and deep samples were found to be 213 and 193 pounds per square foot (psf), respectively.

3.3 CHEMICAL ANALYSES RESULTS

Chemical analyses results classified the coal refuse as lignitic coal with a calorific value of 7,149 British thermal units per pound (Btu/lb). The ash content was approximately 40%, and the sulfur content was approximately 1%. The pH of the coal refuse was 7.6. The complete results of the chemical analyses are presented in Attachment C.

Several analytes were compared against DOGM guidelines for evaluating overburden potential to support a vegetative root zone (Leatherwood and Duce, 1988). Table 2 summarizes

the values of each parameter and its ranking according to Leatherwood and Duce (1988). While the material in the ECMWDS is not intended to support vegetation, the comparison suggests that the ECMWDS is neither toxic nor acid-forming. The sample was ranked as "good" for 8 out of 10 parameters used to classify a material's capacity to act as a vegetative root zone. These 8 parameters included pH, saturation, texture, selenium content, boron content, acid-base potential (ABP), available water capacity, and percentage of rock fragments. Two parameters (specific conductance and sodium adsorption ratio) were measured at levels considered to be "unacceptable" for supporting a vegetative root zone according to the DOGM report.

3.4 SLOPE STABILITY MODEL RESULTS

The slope stability analysis of the ECMWDS incorporated the density, friction angle, and cohesion values obtained from the geotechnical analyses described in Sections 2.2.1 and 3.2 of this report. The slope stability models considered the differences in material properties between material sampled from the upper and lower portions of the ECMWDS. In areas where the ECMWDS exceeded 15 feet thick, the portion of the ECMWDS that was greater than 15 feet deep was modeled with strength and density values corresponding to the sample collected from drillhole TH-1 at a depth of 20 feet. In all areas where the ECMWDS was less than 15 feet thick, and in the top 15 feet of areas where the ECMWDS was greater than 15 feet thick, the material was modeled with the strength and density values corresponding to the sample collected from drillhole TH-1 at a depth of 10 feet. Thus, the lower 15 feet of the ECMWDS (where it was at least 15 feet deep) was modeled with a saturated density of 99.6 pcf, a friction angle of 30.3 degrees, and a cohesion of 193 psf. The upper 15 feet of the ECMWDS (and where it was less than 15 feet thick) was modeled with a saturated density of 93.5 pcf, a friction angle of 28.9 degrees, and a cohesion of 213 psf. The native materials beneath the ECMWDS were given a density of 105 pcf, a friction angle of 28 degrees, and a cohesion of 500 psf, based on engineering judgment. These values were sufficient to restrict the critical failure plane to within the coal refuse, which is considered to occur during the most likely failure scenario. Figure 2 shows the geometry of each slope that was modeled.

The FS for the ECMWDS ranged from 1.74 on the north slope of Profile C-C' to 2.18 on the north slope of Profile B-B'. The FS for each slope is summarized in Table 3. Detailed slope stability analyses are presented in Attachment D.

3.5 DISCUSSION OF RESULTS

Based on the geotechnical analyses and slope stability modeling presented in this report, the ECMWDS conforms to the stability criteria mandated by Utah Administrative Rule R645-301-536.110. All slopes have a FS of at least 1.5, even in the extremely unlikely event that the pile becomes completely saturated.

Chemical analyses of the ECMWDS indicate that the coal refuse can be classified as lignitic coal, and may be used as a fuel resource. Furthermore, the analyses suggest that the material within the ECMWDS is neither toxic nor acid-forming, but is likely too saline to support vegetation. As a point of comparison only, the specific conductance and SAR are too high to rank as good for supporting vegetative root zones. However, the native soils in the vicinity of the ECMWDS may also rank as unacceptably saline according to the criteria outlined by Leatherwood and Duce (1988). The maximum SAR for the Persayo-Chipeta Association, 3-20% slopes, which has been mapped by the National Conservation Service (NRCS) to be the underlying soil at the ECMWDS site, is 13.0 (NRCS, 2008). This ranks as "unacceptable" for supporting vegetative root zones according to Leatherwood and Duce (1988). Hence, although the ECMWDS material has elevated salinity, this condition is widespread and occurs naturally in the region.

CHAPTER 4

REFERENCES

http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. U.S. Department of Agriculture National Resource Conservation Service Web Soil Survey, accessed January 22, 2008.

Leatherwood, James and Dan Duce, 1988. *Guidelines for Management of Topsoils and Overburden for Underground and Surface Coal Mining*. Unpublished report prepared by the State of Utah Department of Natural Resources Division of Oil, Gas, and Mining.

M.Z. Associates, 2002. *Stable for Windows*. Slope Stability Modeling Software.

VTN Engineers, Architects, Planners, and Photogrammetrists, 1976. Topographic Map of Emery Project, Emery and Sevier Counties, Utah. 1"=100' scale.

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FIGURES

FIGURE 1. GENERAL LOCATION MAP

FIGURE 2. EXISTING COAL MINE WASTE DISPOSAL SITE PLAN AND CROSS-SECTIONS

MINE ENTRANCE ROAD

BORING TH-2

BORING TH-1

EXISTING TOPSOIL STOCKPILE T-2

E.1,708,500

N.6,754,000

5960

5970

5980

5990

5975

5988

0'   100'
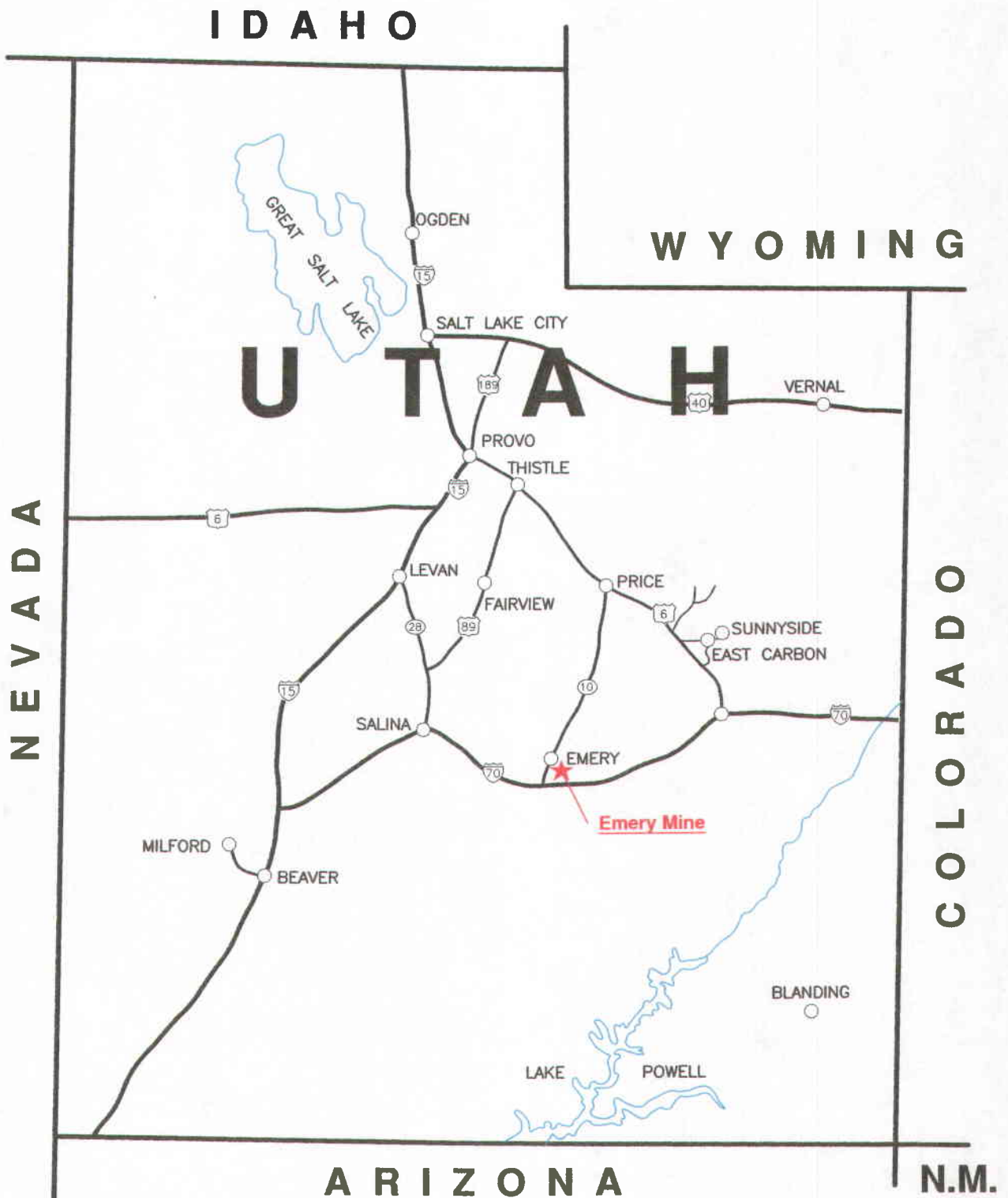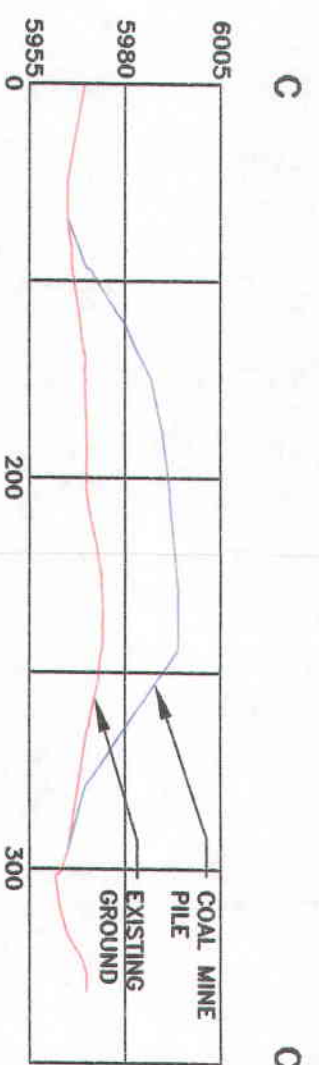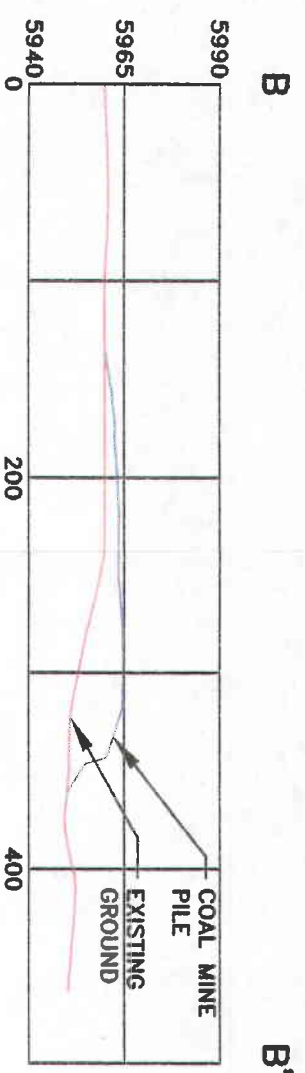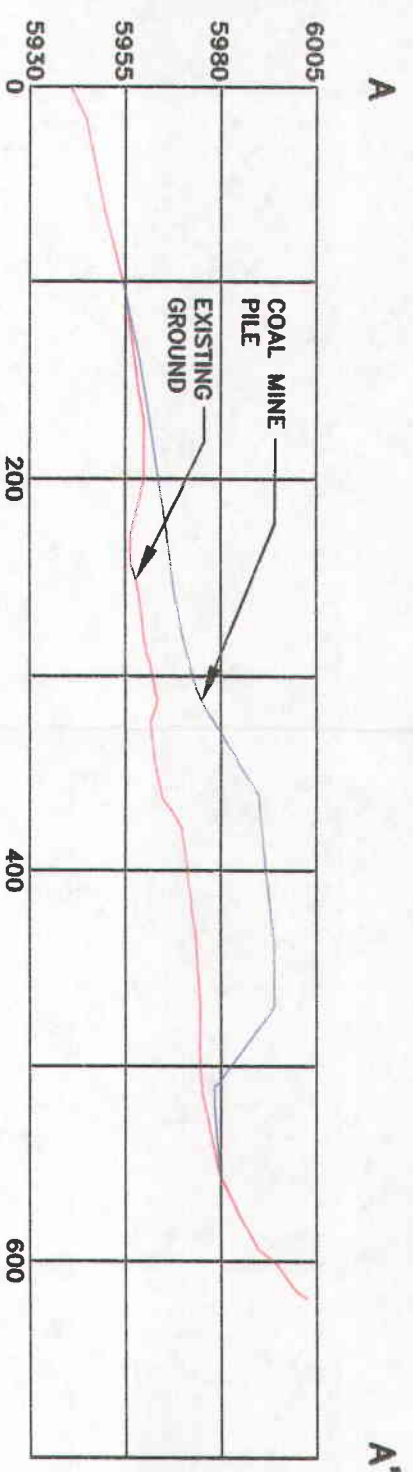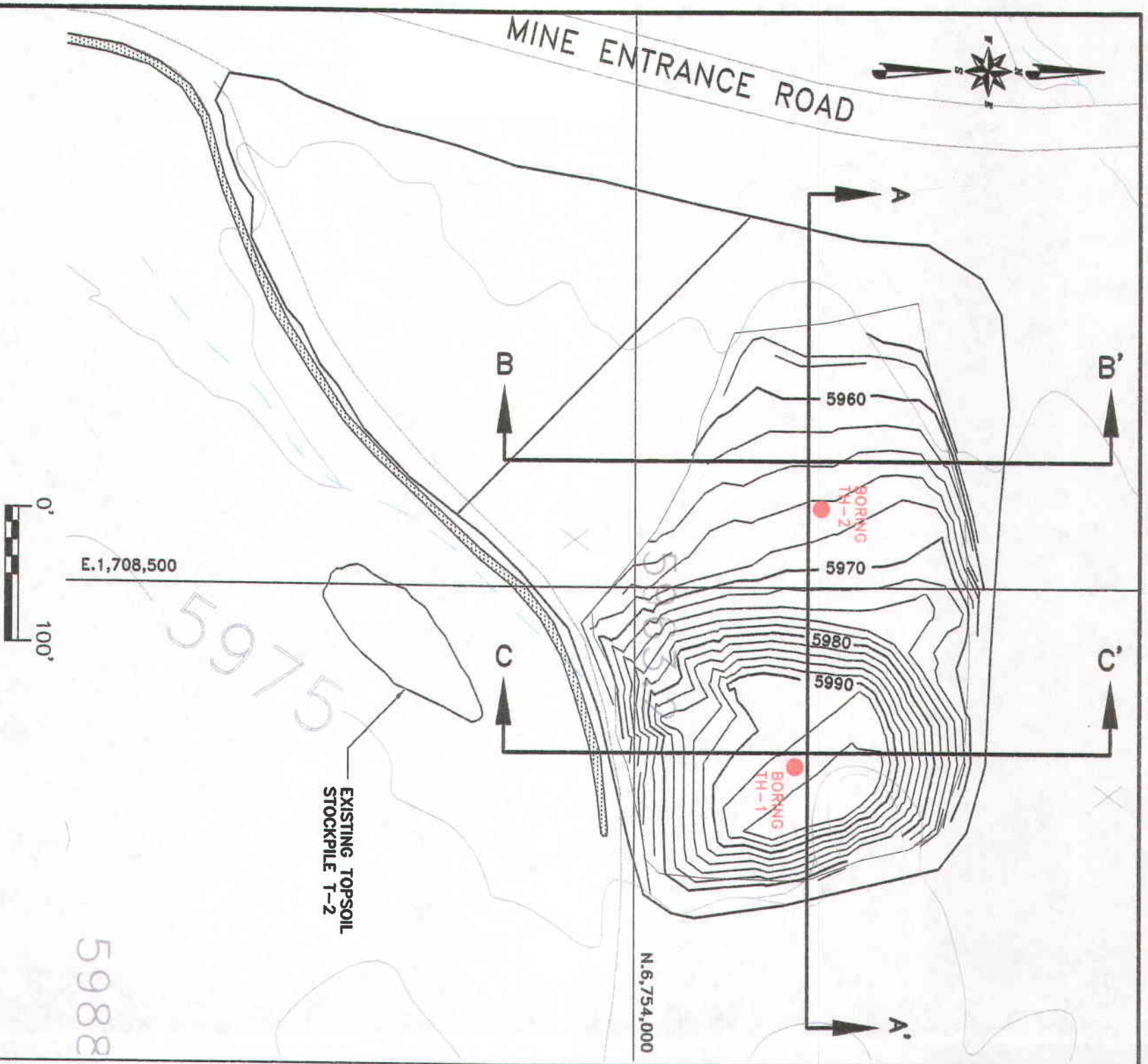
CROSS SECTIONS:
HORZ. SCALE: 1"=100'
VERT. SCALE: 1"=50'

COAL MINE PILE

EXISTING GROUND

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TABLES

TABLE 1
Summary of Geotechnical Sample Analyses
Existing Coal Mine Waste Disposal Site
Consolidation Coal Emery Mine
Emery County, Utah[a]

Parameter	Upper ECMWDS	Lower ECMWDS
USCS Soil Classifications		
In-situ Density (pcf)	64.8[b]	80.0[c]
In-Situ Moisture Content (%)	5.3[b]	8.7[c]
Saturated Density (pcf)	93.5[b]	99.6[c]
Dry Density (pcf)	61.5[b]	80.0[c]
Standard Proctor Compaction Test (ASTM D698) Maximum Dry Density (pcf)	81.2[d]	117.5[e]
Standard Proctor Compaction Test (ASTM D698) Optimum Moisture Content (%)	12.3[d]	12.5[e]
Friction Angle (degrees)	28.9[b]	30.3[c]
Cohesion (psf)	213[b]	193[c]

[a] Refer to Attachment B for detailed geotechnical analysis results.
[b] Undisturbed sample from TH-1 @10'.
[c] Undisturbed sample from TH-1 @20'.
[d] Average of disturbed samples collected from 0-10' in both drillholes.
[e] Disturbed sample from TH-1, 15-25'.

TABLE 2
Evaluation of ECMWDS Material Properties as a Vegetative Root Zone
Existing Coal Mine Waste Disposal Site
Consolidation Coal Emery Mine
Emery County, Utah

Parameter	Bulk Sample	Criteria for a Rank of "Good" [a]
pH	7.6	6.1 – 8.2
Specific Conductance (mmhos/cm)	91.0[b]	0 – 2
Saturation (%)	31.0	25 – 80
Texture	sl	sl, l, sil, scl, vfscl, fsl
Sodium Adsorption Ratio (SAR)	89.0[c]	0 – 4
Selenium (ppm)	< 0.02	< 0.1
Boron (ppm)	1.46	< 5.0
Acid/Base Potential (ABP) (t $CaCO_3$ / 1,000 t mat'l)	73.2	> 5
Available Water Capacity (in/in)	9.84	> 0.10
Rock Fragments (% volume) 3 in.	0	0 - 15
3-10 in.	0	0 – 15
10 in	0	0 – 3

[a] As determined by Leatherwood and Duce (1988)

[b] Typical value of specific conductance for the mapped NRCS soils unit (Persayo-Chipeta Association, 3-20% slopes) is 8 mmhos/cm (NRCS ,2008), which is considered fair – poor according to Leatherwood and Duce (1988).

[c] Typical value of SAR for the mapped NRCS soils unit (Persayo-Chipeta Association, 3-20% slopes) is 13.0 (NRCS ,2008), which is considered unacceptable according to Leatherwood and Duce (1988)

TABLE 3
Summary Slope Stability Model Results
Existing Coal Mine Waste Disposal Site
Consolidation Coal Emery Mine
Emery County, Utah

PROFILE	FS
A-A' West Slope	1.835
A-A' East Slope	1.858
B-B' North Slope	2.181
C-C' North Slope	1.736
C-C' South Slope	2.055
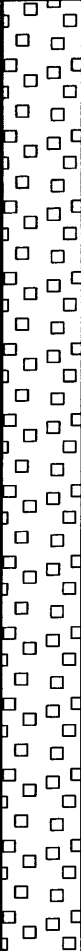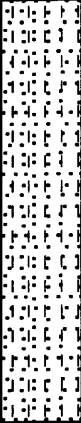
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ATTACHMENT A

Drillhole Logs

Geotechnical Engineering Group, Inc.

LOG OF TEST PIT TH-1

PROJECT:	Consol Emery Coal Mine	PROJECT NO.:	2850
CLIENT:			
LOCATION:	See figure 2	ELEVATION:	Unknown None
DRILLER:	WJ	LOGGED BY:	SP
DEPTH TO WATER> INITIAL: ⊻ None Found		AFTER 24 HOURS: ⊻	Backfilled
DATE: 11-26-2007		DEPTH TO CAVING: ⌐	None
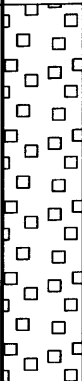
Depth (feet)	Description	Graphic	Sample Type	Blow Counts	Notes
0					
	Coal, dry, black, (COAL)				
5			Bulk / Bulk		
10			CT	21/12	
15					
20			CT	16/12	
25	Sand, slightly clayey, silty, gravelly, slightly moist, brown, (SP-SM)		Bul		
30					
35			Bulk		
	Bottom of test pit when terminated: 36 ft.				

This information pertains only to this test pit and should not be interpreted as being indicitive of the site.

PROJECT: Consol Emery Coal Mine   **PROJECT NO.:** 2850

CLIENT:

LOCATION: See figure 2   **ELEVATION:** Unknown None

DRILLER: WJ   **LOGGED BY:** SP

DEPTH TO WATER> INITIAL: ☷ None Found   **AFTER 24 HOURS:** ☷ Backfilled

DATE: 11-26-2007   **DEPTH TO CAVING:** ☍ None

Depth (feet)	Description	Graphic	Sample Type	Blow Counts	Notes
0					
	Coal, dry, black, (COAL)				
5			Bulk		
			Bulk		
10					
	Sand, slightly clayey, silty, slightly gravelly, slightly moist, brown to tan, (SP-SM)		Bulk		
15					
			Bulk		
	Bottom of test pit when terminated: 16 ft.				
20					
25					
30					
35					

Engineering Group, Inc.

Symbol   Description

<u>Strata symbols</u>

Coal

Poorly graded sand
with silt

<u>Notes:</u>

1. Exploratory borings were drilled on 11-26-2007 using a
   4-inch diameter continuous flight power auger.

2. No free water was encountered at the time of drilling or
   when re-checked the following day.

3. These logs are subject to the interpretation by GEG of the soils
encountered and limitations, conclusions, and recommendations in this
report.

4. Results of tests conducted on samples recovered are reported
   on the logs.

ATTACHMENT B

Geotechnical Analyses

UNDISTURBED SOIL SAMPLE DENSITY CALCULATIONS
EXISTING COAL MINE WASTE DISPOSAL SITE
CONSOL EMERY MINE

Dry Density

TH-1 10'

Weight (lbs)		Volume (ft3)
0.0	Air	0.51
0.0	Water	0.00
61.5	Solids	0.49
61.5	TOTAL	1.0

TH-1 20'

Weight (lbs)		Volume (ft3)
0.0	Air	0.42
6.4	Water	0.00
73.6	Solids	0.58
80.0	TOTAL	1.0

Saturated Density

TH-1 10'

Weight (lbs)		Volume (ft3)
0.0	Air	0
32.0	Water	0.51
61.5	Solids	0.49
93.5	TOTAL	1.0

TH-1 20'

Weight (lbs)		Volume (ft3)
0.0	Air	0
26.0	Water	0.42
73.6	Solids	0.58
99.6	TOTAL	1.0

In-Situ Density

TH-1 10'

Weight (lbs)		Volume (ft3)
0.0	Air	0.46
3.3	Water	0.05
61.5	Solids	0.49
64.8	TOTAL	1.00

TH-1 20'

Weight (lbs)		Volume (ft3)
0.0	Air	0.31
6.4	Water	0.10
73.6	Solids	0.58
80.0	TOTAL	1.00

Notes:

Dry densities were taken from the geotechnical analyses of the undisturbed samples taken from TH-1 at 10' and 20' deep.

The average specific gravity of the solids fraction of the coal refuse was taken as 2.02. This is the average of 2.65 (a typical value for soil) and 1.4 (a typical value for bituminous coal). Chemical analyses (presented in Appendix C) indicate that the coal refuse is approximately 50% coal and 50% siliceous material. A specific gravity of 2.02 corresponds to a density of 126.11 pounds per cubic foot.

The weight of the air fraction of the coal refuse was assumed to be negligible in all cases.

In-situ densities were calculated using the water contents measured for each of the undisturbed samples (TH-1@10' = 5.3% and TH-1@20' = 8.7%)

Geotechnical Engineering Group, Inc.
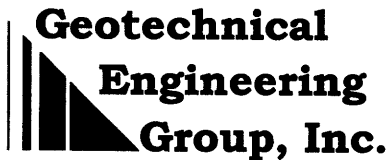
January 21, 2008

Ari Menitove
7324 South Union Park Ave.
Midvale, Utah 84047

Attention: Mr. Menitove

Subject: Field Sampling and Laboratory Testing Services
             Consol Emery Coal Mine
             Job No. 2,850

Dear Mr. Menitove,

As requested, Geotechnical Engineering Group (GEG) performed field sampling and laboratory testing services on samples obtained by a GEG representative on November 26, 2007. Results of laboratory testing are included on Figs 6 though 17 and summarized on Table I.

We believe the laboratory study was performed and this letter was prepared in a manner consistent with that level of care and skill ordinarily used by geotechnical engineers practicing in this area at this time. No other warranty, either express or implied, is made. When we may be of further service or answer any questions from a geotechnical or construction materials point of view, please call.

Sincerely,
GEOTECHNICAL ENGINEERING GROUP, INC.

                                          Reviewed By:

Terry Myers   Robert W. Anderson
Laboratory Supervisor   Staff Engineer
TM:RA:ra
(1 copy sent)

Lab and Drilling Only
Consol Emery Coal Mine
Emery, Utah

N

No Scale

Subject Site
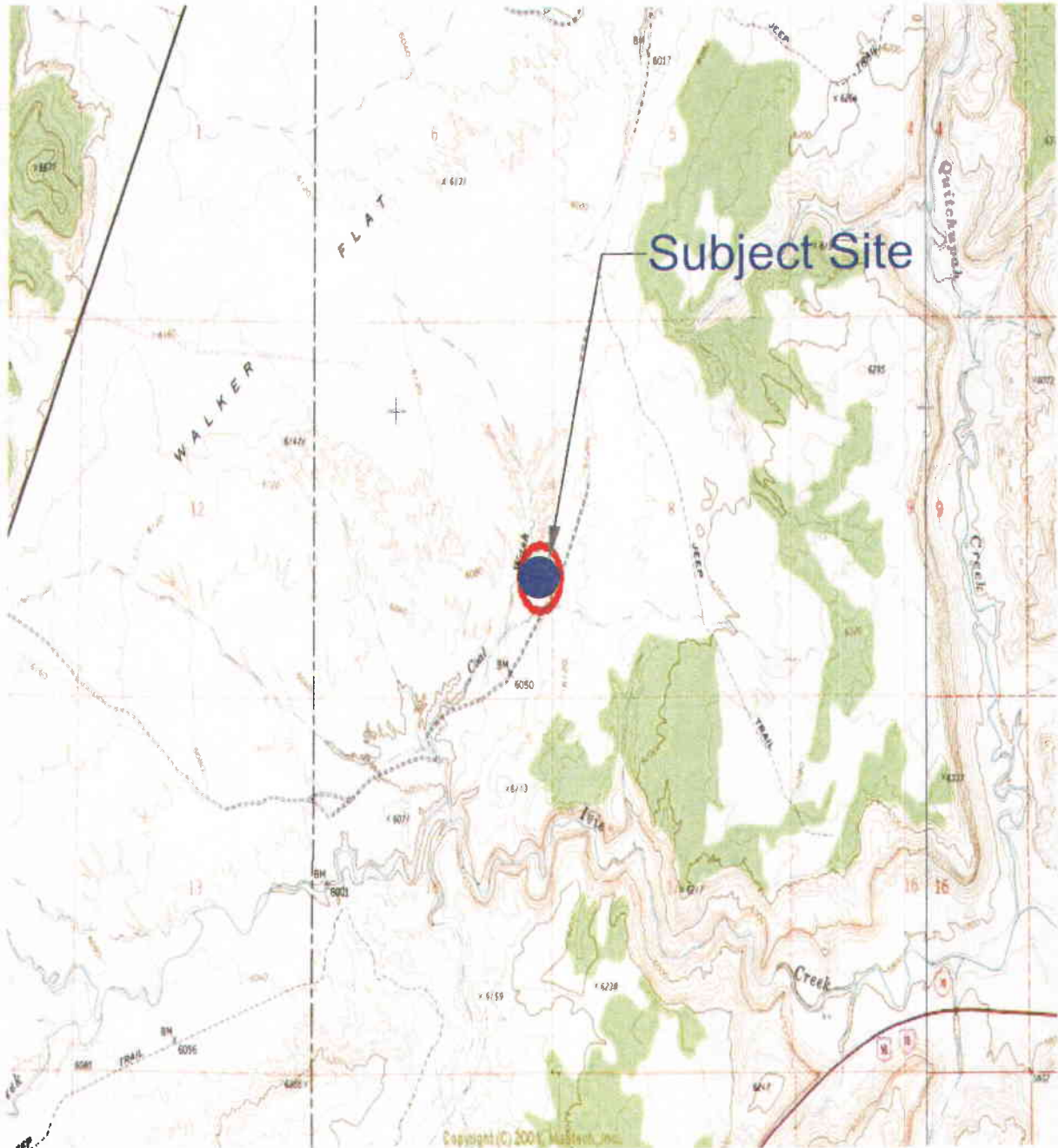
Note: This figure was prepared based
on in house drawing and is intended to
show approximate locations of
Exploratory Test Borings only.
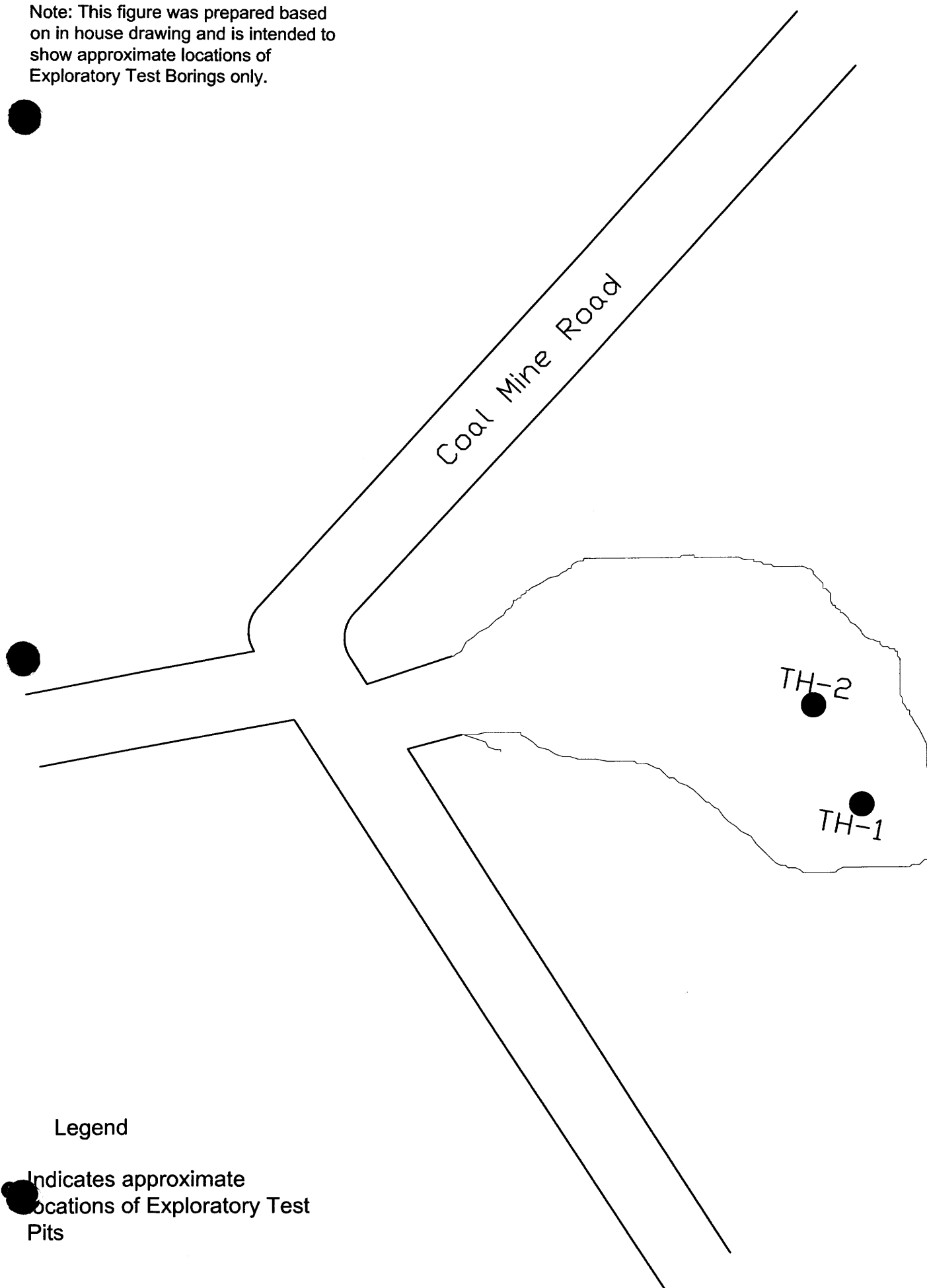
N

No Scale

Coal Mine Road

TH-2

TH-1

Legend

Indicates approximate
locations of Exploratory Test
Pits

Job No. 2,850   Location of Exploratory Borings   Fig. 2

Gradation Test Report
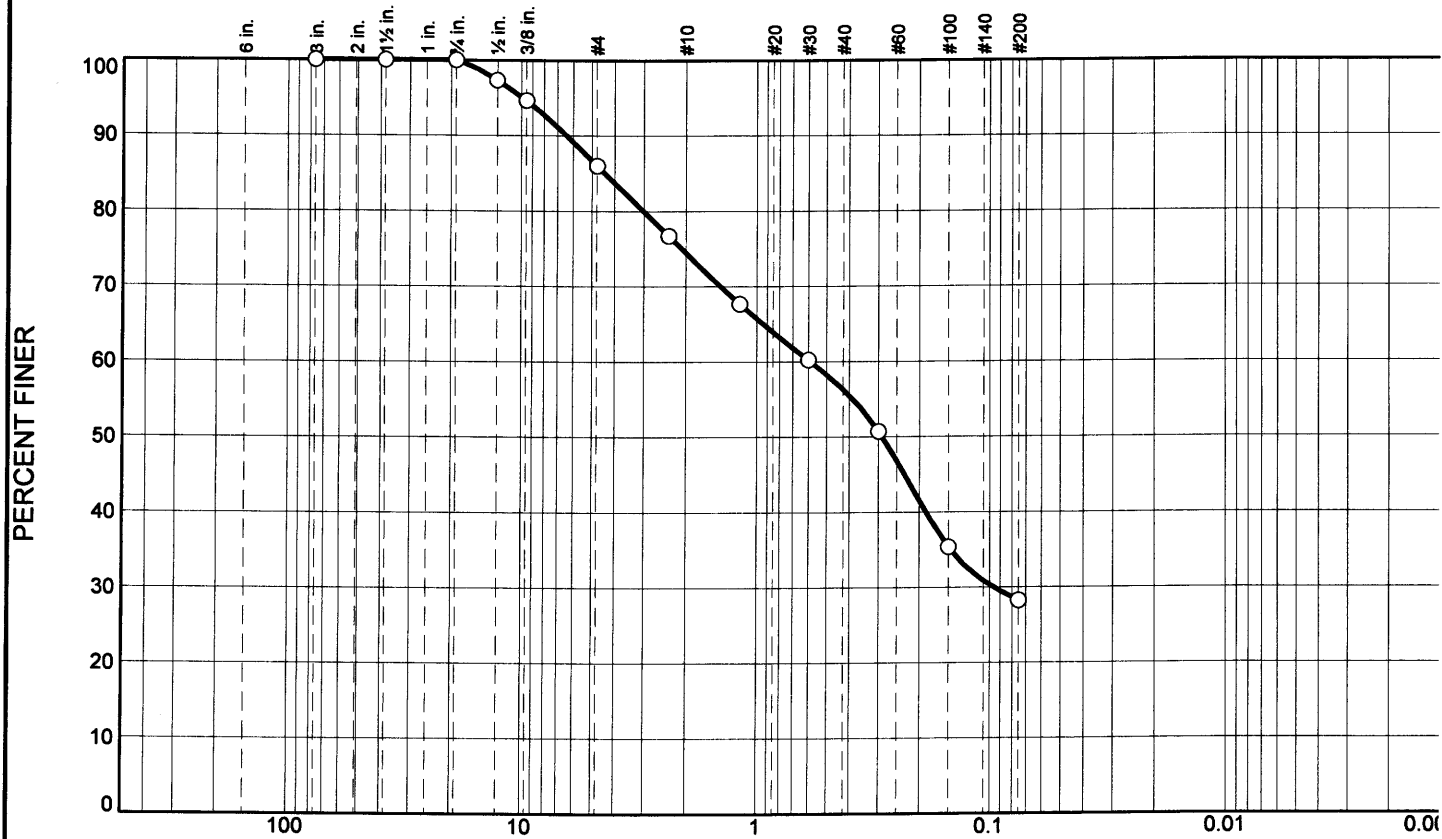
GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	14	12	18	28	28	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
.75	100		
.5	97		
.375	95		
#4	86		
#8	77		
#16	68		
#30	60		
#50	51		
#100	35		
#200	28		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL=   LL=   PI=

Classification

USCS=   AASHTO=

Coefficients

D_{85}= 4.4013 D_{60}= 0.5861 D_{50}= 0.2893
D_{30}= 0.0961 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 12-10-2007 **Tested By:** JG

Remarks

Sample No.: **Source of Sample:** TH-1 **Date Sampled:**
Location: **Elev./Depth:** 0-10
Checked By: MT **Title:**

Geotechnical Engineering Group, Inc.

Client:
Project: Consol Emery Coal Mine

Project No: 2850 **Figure** 6

Gradation Test Report
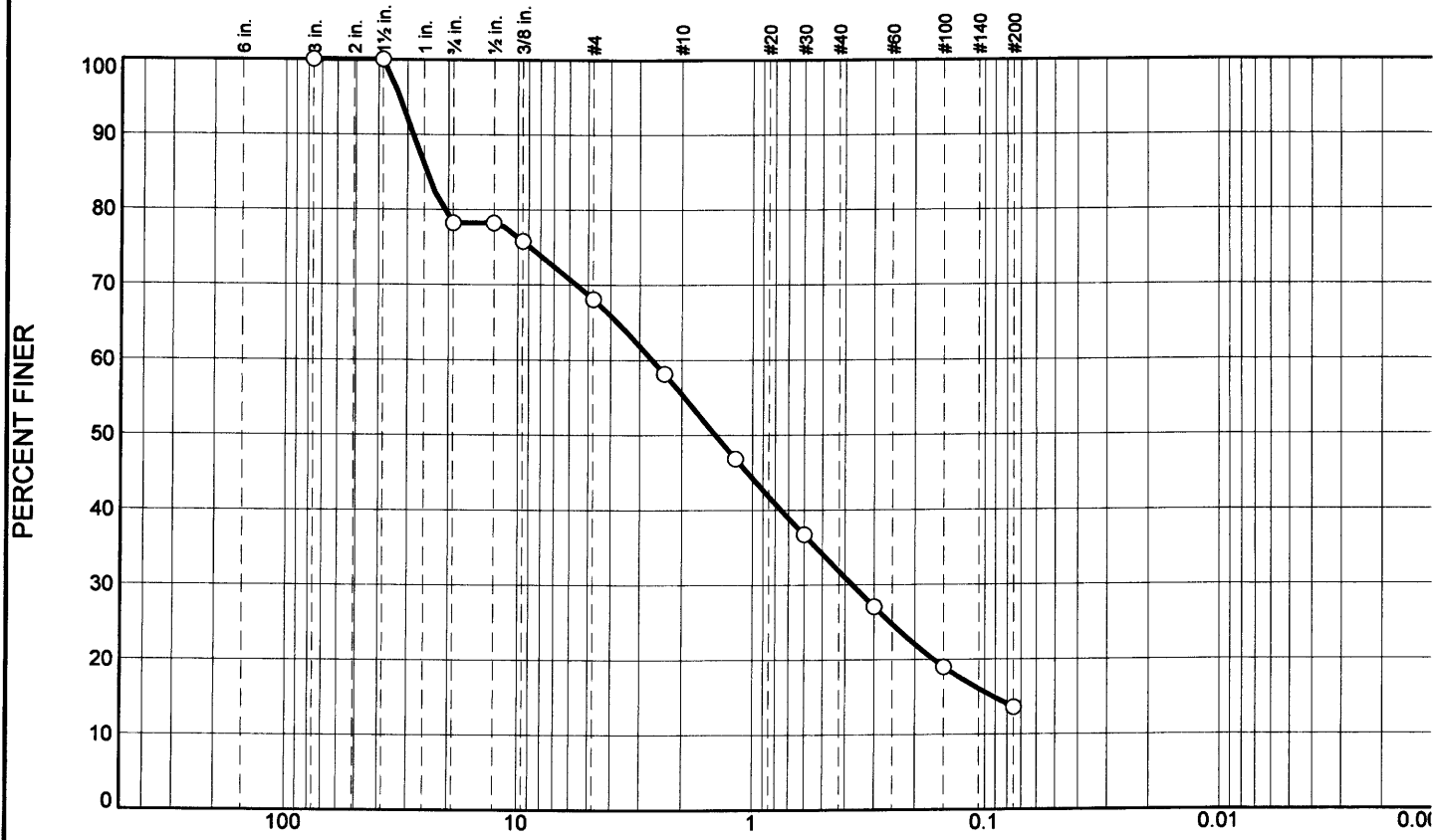
GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	22	10	12	24	18	14	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
.75	78		
.5	78		
.375	76		
#4	68		
#8	58		
#16	47		
#30	37		
#50	27		
#100	19		
#200	14		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL=　　　　　LL=　　　　　PI=

Classification

USCS=　　　　　AASHTO=

Coefficients

D_{85}= 24.7358　　D_{60}= 2.6485　　D_{50}= 1.4338
D_{30}= 0.3727　　D_{15}= 0.0914　　D_{10}=
C_u=　　　　　C_c=

Date Tested: 12-14-2007 **Tested By:** TAM

Remarks

Sample No.: 　**Source of Sample:** TH-1　**Date Sampled:**
Location: 　**Elev./Depth:** 10
Checked By: MT　**Title:**

Geotechnical Engineering Group, Inc.

Client:
Project: Consol Emery Coal Mine
Project No: 2850　**Figure** 7

Gradation Test Report
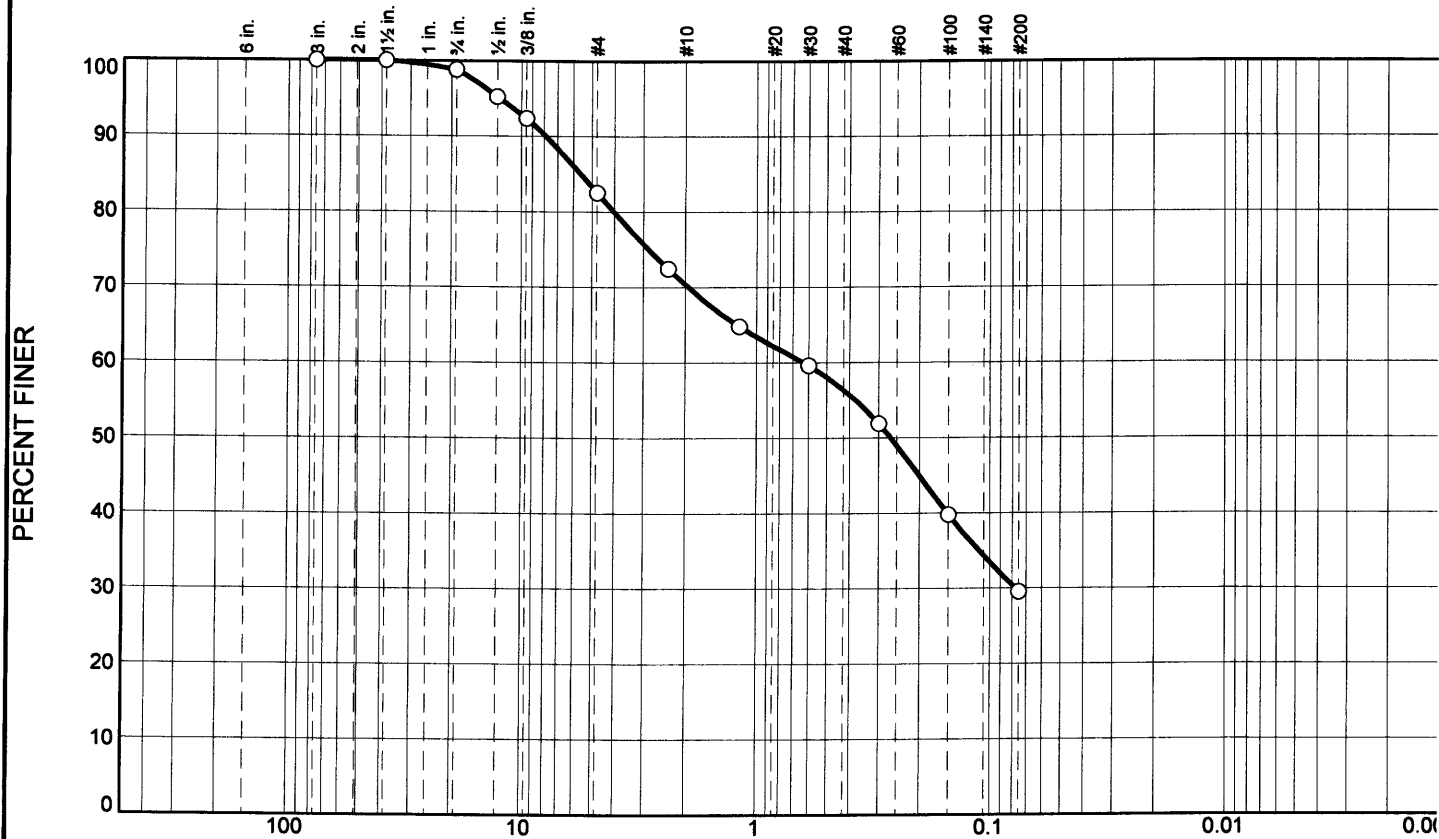
PERCENT FINER vs GRAIN SIZE - mm.

| % +3" | % Gravel | | % Sand | | | % Fines | |
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	1	16	13	14	27	29	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
.75	99		
.5	95		
.375	92		
#4	83		
#8	72		
#16	65		
#30	60		
#50	52		
#100	40		
#200	29		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)
PL=   LL=   PI=

Classification
USCS=   AASHTO=

Coefficients
D_{85}= 5.5841 D_{60}= 0.6285 D_{50}= 0.2666
D_{30}= 0.0778 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 12-10-2007 **Tested By:** TAM

Remarks

Sample No.:
Location:
Checked By: MT

Source of Sample: TH-1

Title:

Date Sampled:
Elev./Depth: 15-25

Geotechnical Engineering Group, Inc.

Client:
Project: Consol Emery Coal Mine

Project No: 2850

Figure 8

Gradation Test Report
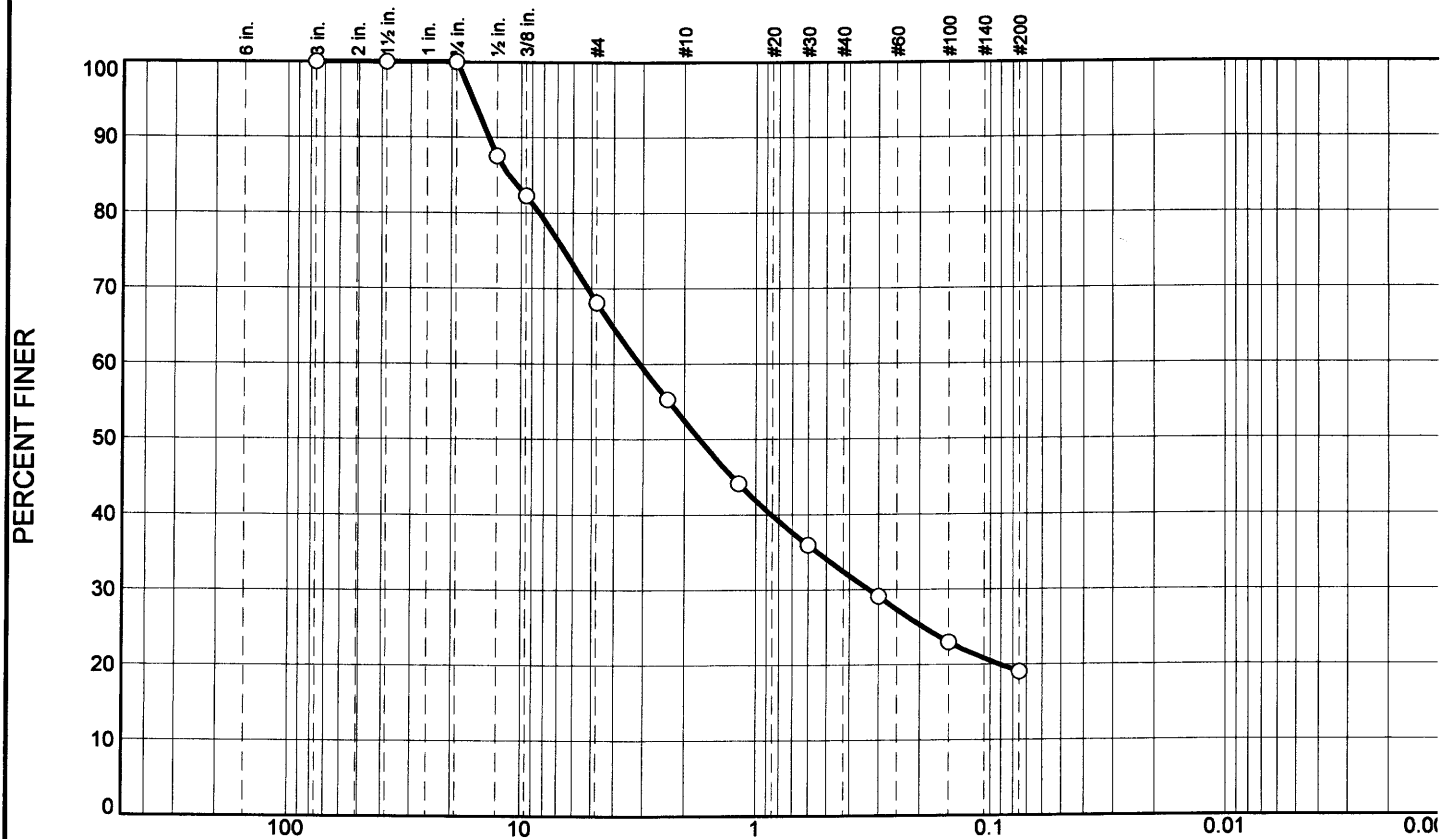
PERCENT FINER vs GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	32	16	20	13	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
.75	100		
.5	88		
.375	82		
#4	68		
#8	55		
#16	44		
#30	36		
#50	29		
#100	23		
#200	19		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)
PL=   LL=   PI=

Classification
USCS=   AASHTO=

Coefficients
D_{85}= 11.2834 D_{60}= 3.0951 D_{50}= 1.7237
D_{30}= 0.3304 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 12-11-2007 **Tested By:** TAM

Remarks

Sample No.: **Source of Sample:** TH-1 **Date Sampled:**
Location: **Elev./Depth:** 20
Checked By: MT **Title:**

Geotechnical Engineering Group, Inc.

Client:
Project: Consol Emery Coal Mine

Project No: 2850 **Figure** 9

Gradation Test Report
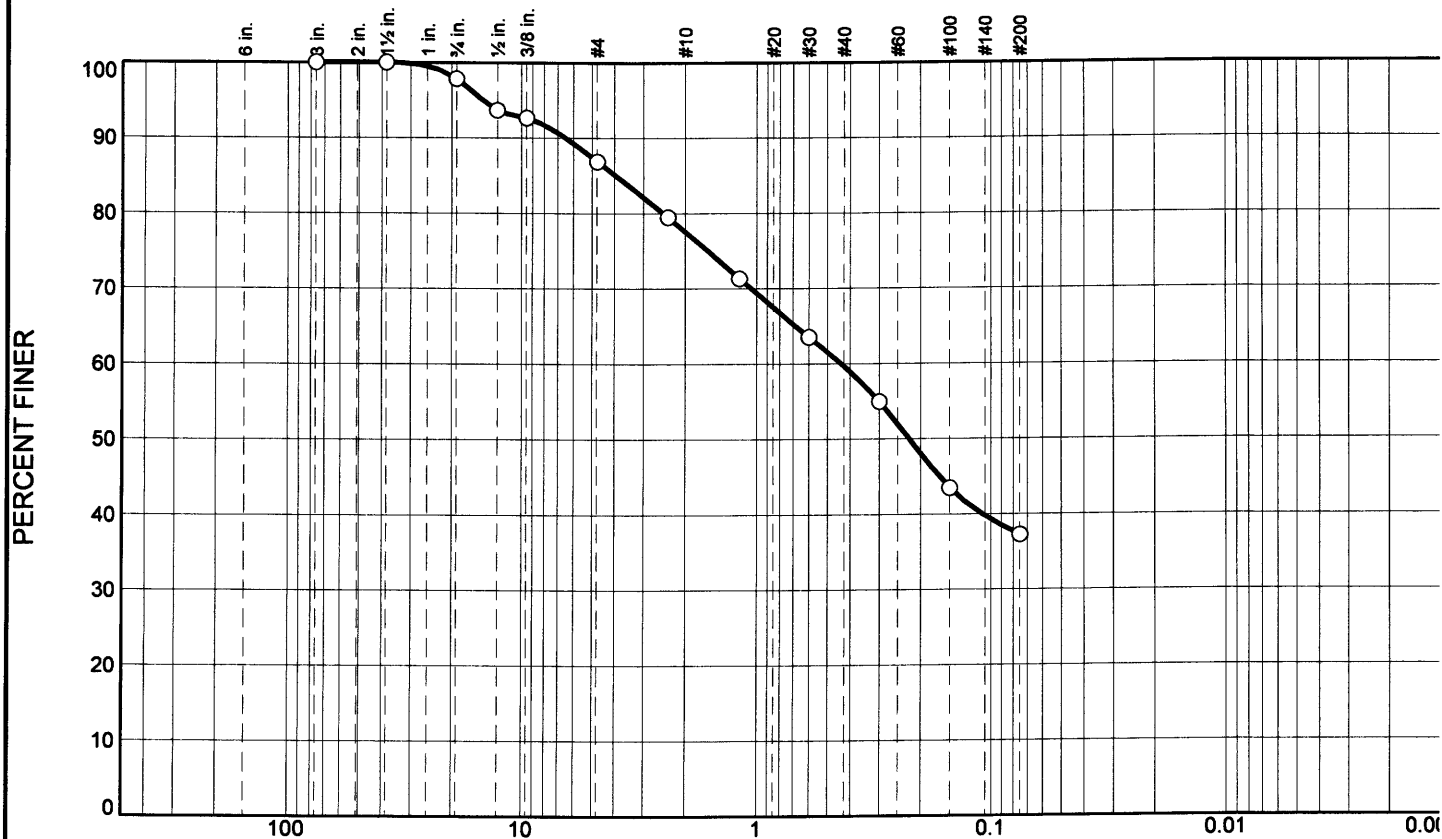
% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	11	9	18	23	37	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
1.5	100		
.75	98		
.5	94		
.375	93		
#4	87		
#8	79		
#16	71		
#30	64		
#50	55		
#100	43		
#200	37		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)
PL=   LL=   PI=

Classification
USCS=   AASHTO=

Coefficients
D_{85}= 3.9644 D_{60}= 0.4367 D_{50}= 0.2239
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 12-10-2007 **Tested By:** AI

Remarks

Sample No.:   **Source of Sample:** TH-2   **Date Sampled:**
Location: **Elev./Depth:** 0-10
Checked By: MT   **Title:**

Geotechnical Engineering Group, Inc.

Client:
Project: Consol Emery Coal Mine
Project No: 2850   **Figure** 10

LIQUID AND PLASTIC LIMITS TEST REPORT

Dashed line indicates the approximate upper limit boundary for natural soils

CH or OH

CL or OL

CL-ML

ML or OL

MH or OH

PLASTICITY INDEX

LIQUID LIMIT
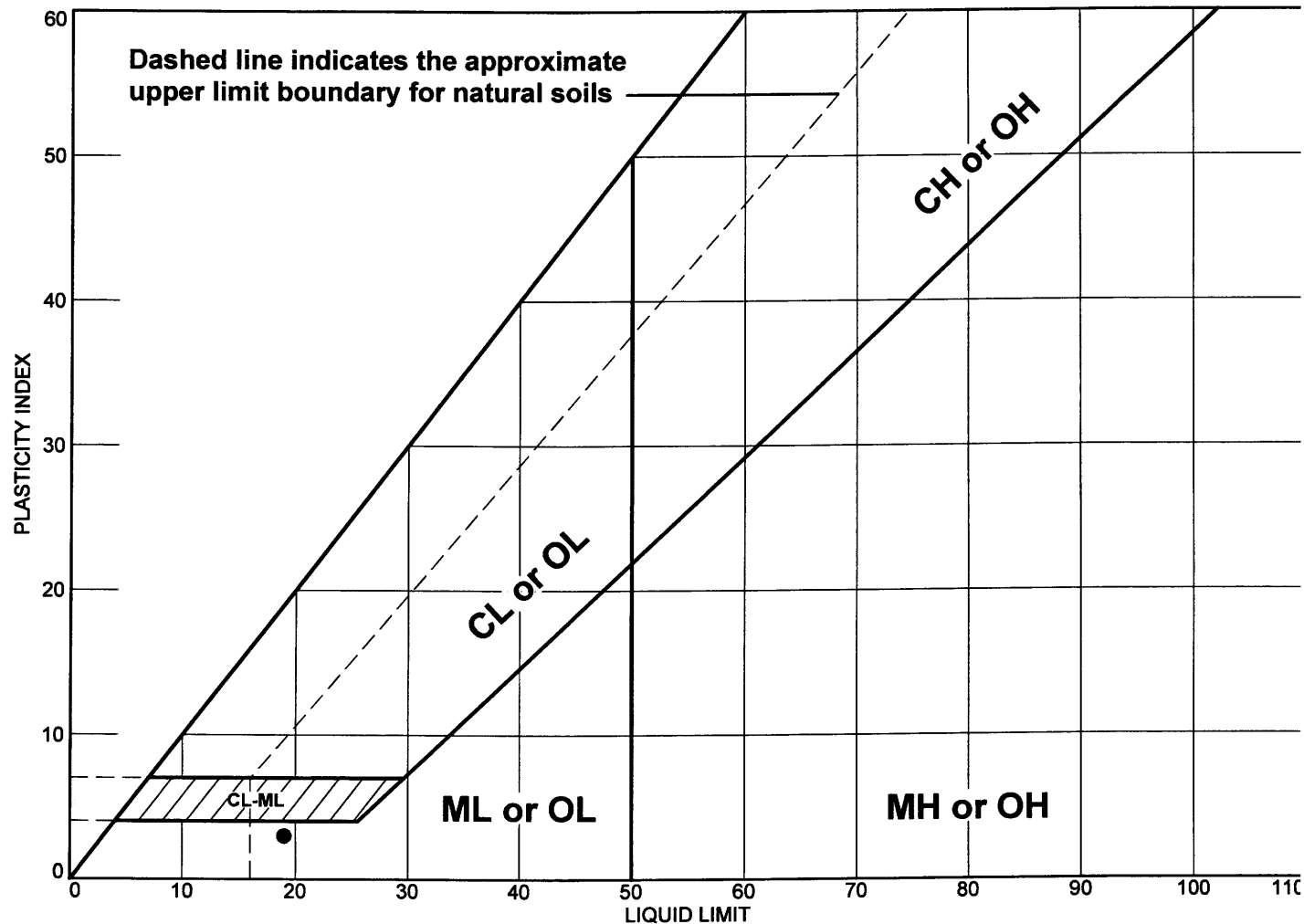
MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	19	16	3	56	28	SM
■	18	18	NP	56	29	SM

Project No. 2850   **Client:**

Project: Consol Emery Coal Mine

● **Source of Sample:** TH-1   **Depth:** 0-10
■ **Source of Sample:** TH-1   **Depth:** 15-25

Remarks:

Geotechnical
Engineering
Group, Inc.

Figure 11

Tested By: JD   **Checked By:** MT

LIQUID AND PLASTIC LIMITS TEST REPORT

Dashed line indicates the approximate upper limit boundary for natural soils

Chart — PLASTICITY INDEX (y-axis, 0 to 60) vs LIQUID LIMIT (x-axis, 0 to 110), with regions labeled CH or OH, CL or OL, CL-ML, ML or OL, MH or OH.
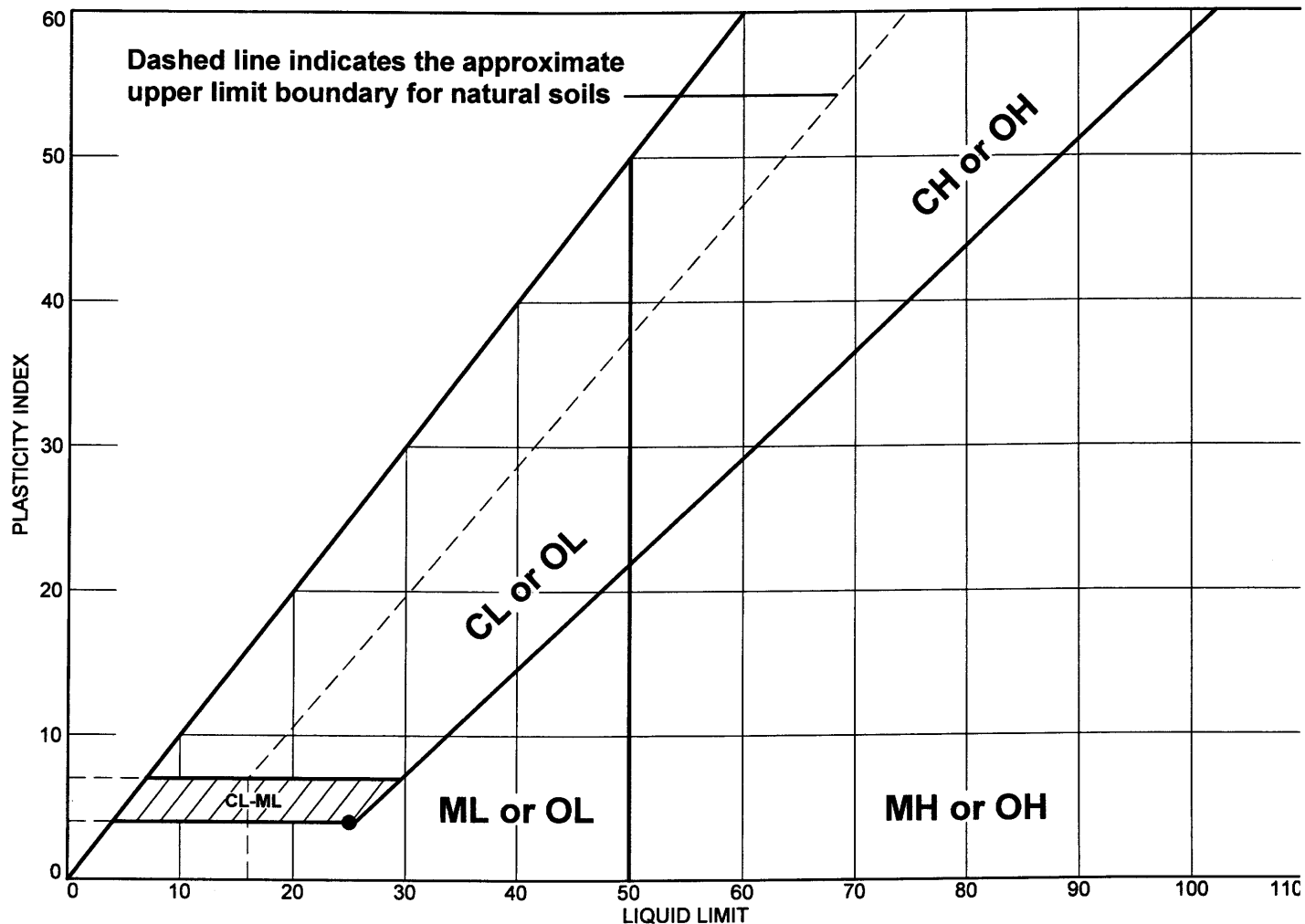
MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
	25	21	4	60	37	SC-SM

Project No. 2850   **Client:**

Project: Consol Emery Coal Mine

Source of Sample: TH-2   **Depth:** 0-10

Remarks:

Geotechnical Engineering Group, Inc.

Figure 12

Tested By: JD   **Checked By:** MT

Moisture-Density Relationship Curve (Proctor)

Geotechnical Engineering Group, Inc.

Project No.: 2850   **Date:**

Project: Consol Emery Coal Mine

Source: TH-1   **Elev./Depth:** 0-10   **Sample No.**

Remarks:

MATERIAL DESCRIPTION

Description:

Classifications -	**USCS:** SM	**AASHTO:** A-2-4(0)
Nat. Moist. =		**Sp.G. =**
Liquid Limit = 19		**Plasticity Index =** 3
% > No.4 = 14.0 %		**% < No.200 =** 28 %

TEST RESULTS

Maximum dry density = 83.5 pcf

Optimum moisture = 14.0 %

Test specification:
ASTM D 698-91 Procedure A Standard

100% SATURATION CURVES
FOR SPEC. GRAV. EQUAL TO:

2.8
2.7
2.6

Dry density, pcf vs. Water content, %
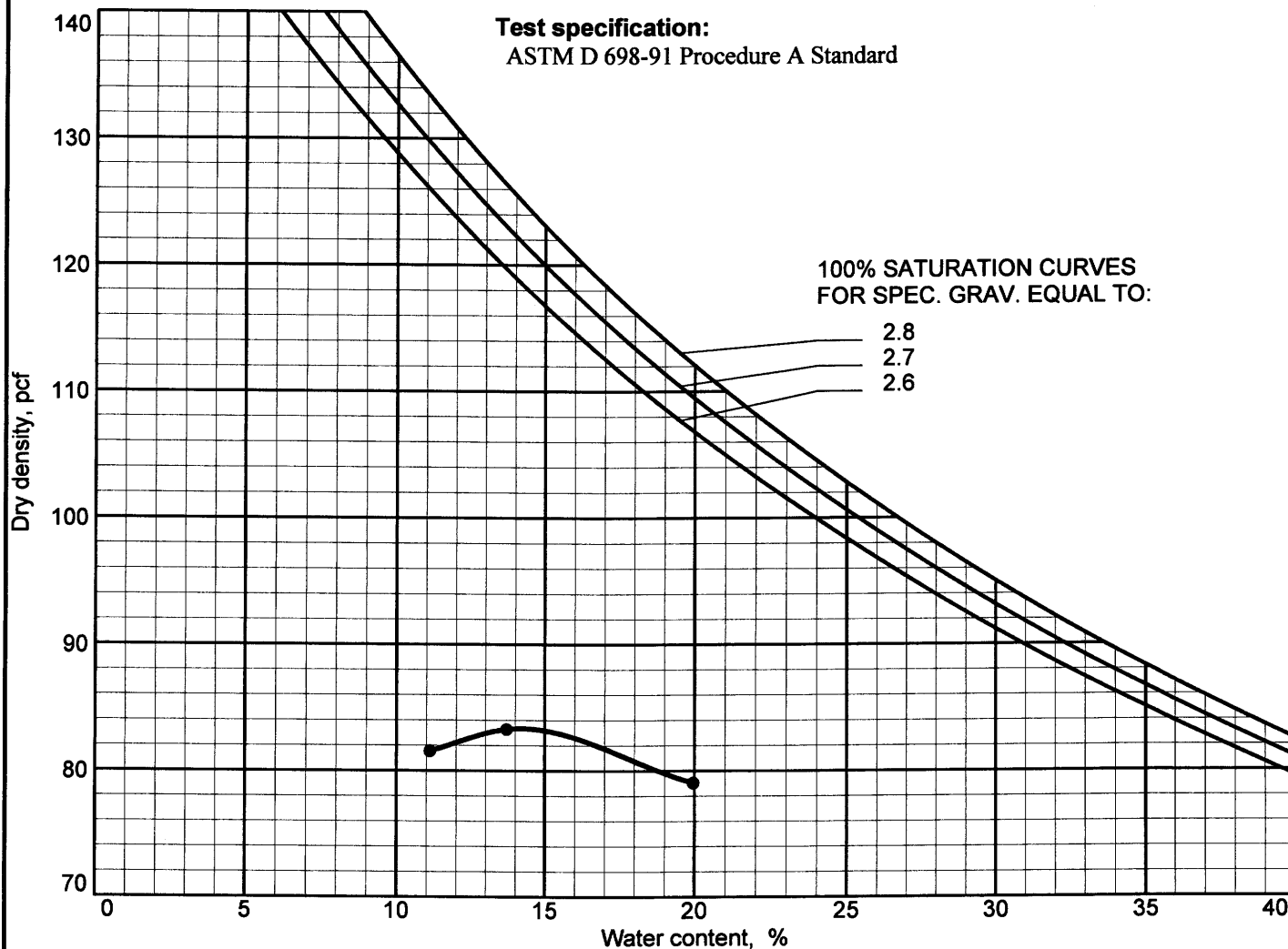
Figure 13

Moisture-Density Relationship Curve (Proctor)

**Geotechnical
Engineering
Group, Inc.**

Project No.: 2850

Project: Consol Emery Coal Mine

Date:

Source: TH-1

Elev./Depth: 15-25

Sample No.

Remarks:

MATERIAL DESCRIPTION

Description:

Classifications -

Nat. Moist. =

Liquid Limit = 18

% > No.4 = 17.0 %

USCS: SM

Sp.G. =

Plasticity Index = NP

% < No.200 = 29 %

AASHTO: A-2-4(0)

TEST RESULTS
Maximum dry density = 117.5 pcf
Optimum moisture = 12.5 %

Test specification:
ASTM D 698-91 Procedure A Standard

100% SATURATION CURVES
FOR SPEC. GRAV. EQUAL TO:

2.8
2.7
2.6

Figure 14

Moisture-Density Relationship Curve (Proctor)

**Geotechnical
Engineering
Group, Inc.**

Project No.: 2850

Date:

Project: Consol Emery Coal Mine

Source: TH-2

Elev./Depth: 0-10

Sample No.

Remarks:

MATERIAL DESCRIPTION

Description:

Classifications -	**USCS:** SC-SM	**AASHTO:** A-4(0)
Nat. Moist. =		**Sp.G. =**
Liquid Limit = 25		**Plasticity Index =** 4
% > No.4 = 13.0 %		**% < No.200 =** 37 %

TEST RESULTS
Maximum dry density = 79.5 pcf
Optimum moisture = 16.0 %

Test specification:
ASTM D 698-91 Procedure A Standard

100% SATURATION CURVES
FOR SPEC. GRAV. EQUAL TO:

2.8
2.7
2.6

Figure 15

Vertical Deformation, in. vs Strain, % (top left chart)

Fail. Stress, psi vs Normal Stress, psi (top right chart)

	Results
C, psi	12.39
φ, deg	46.2
Tan(φ)	1.04

Shear Stress, psi vs Strain, % (bottom left chart)
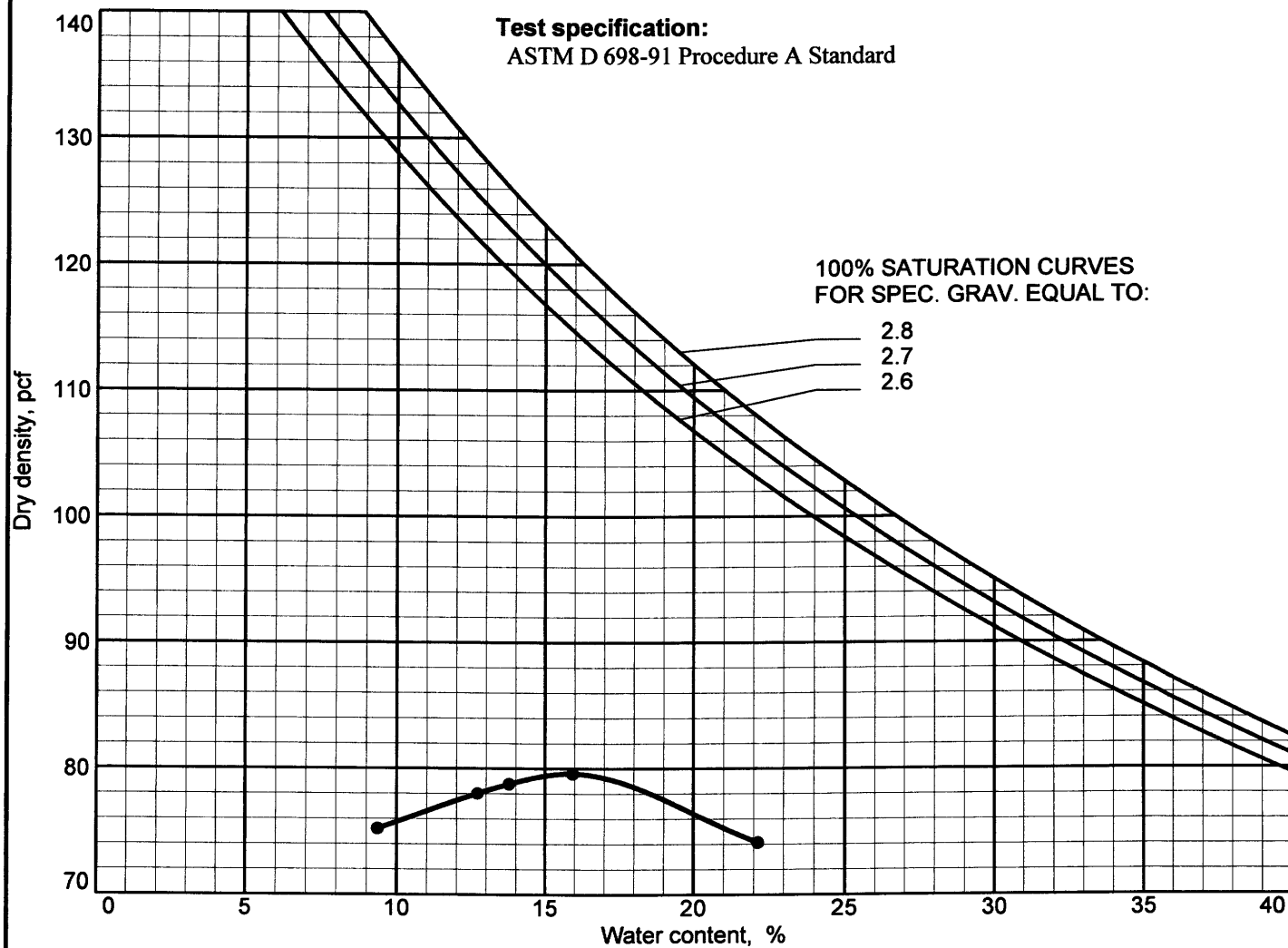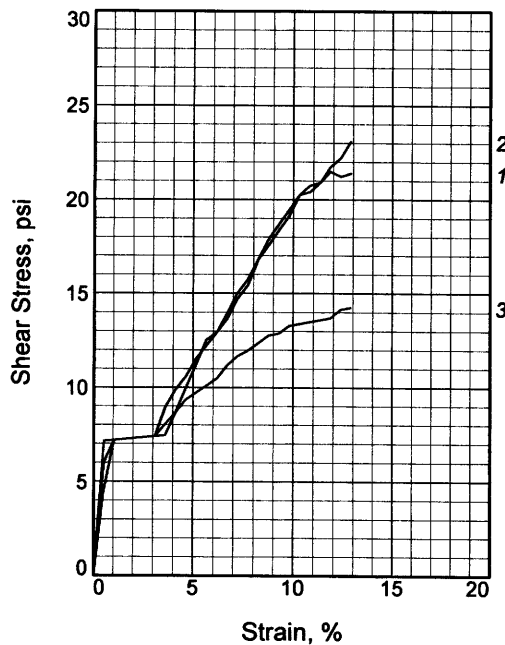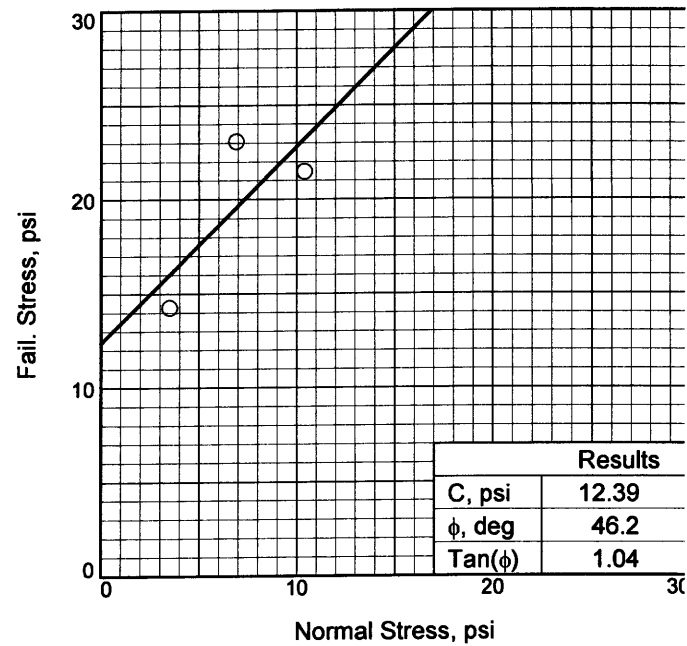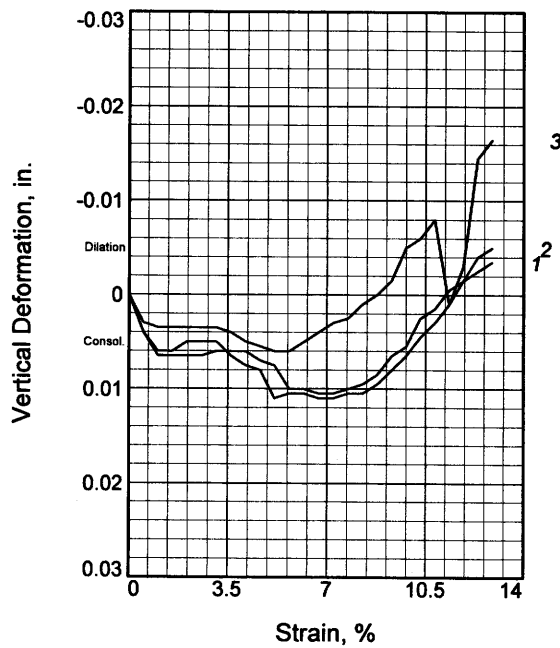
Sample No.		1	2	3
Initial	Water Content, %	5.3	5.3	5.3
	Dry Density, pcf	61.5	61.5	61.5
	Saturation, %	8.4	8.4	8.4
	Void Ratio	1.6880	1.6880	1.6880
	Diameter, in.	1.94	1.94	1.94
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	32.7	32.7	32.7
	Dry Density, pcf	61.5	61.5	61.5
	Saturation, %	51.4	51.4	51.4
	Void Ratio	1.6880	1.6880	1.6880
	Diameter, in.	1.94	1.94	1.94
	Height, in.	1.00	1.00	1.00
Normal Stress, psi		10.40	6.90	3.50
Fail. Stress, psi		21.49	23.08	14.26
Strain, %		11.8	12.9	12.9
Ult. Stress, psi				
Strain, %				
Strain rate, in./min.		0.63	0.63	0.63

Sample Type: CT
Description:

Assumed Specific Gravity= 2.65
Remarks:

Client:

Project: Consol Emery Coal Mine

Source of Sample: TH-1   **Depth:** 10

Proj. No.: 2850   **Date Sampled:**

Geotechnical Engineering Group, Inc.

Figure 16

Tested By: AI   **Checked By:** MT

	Strain, %	Vertical Deformation graph

Vertical Deformation, in.
-0.03, -0.02, -0.01, 0 (Consol., Dilation), 0.01, 0.02, 0.03
Strain, %: 0, 3.5, 7, 10.5, 14
Curves labeled 3, 2, 1

Fail. Stress, psi: 0, 10, 20, 30
Normal Stress, psi: 0, 10, 20, 30

	Results
C, psi	10.93
φ, deg	54.0
Tan(φ)	1.38

Shear Stress, psi: 0, 5, 10, 15, 20, 25, 30
Strain, %: 0, 5, 10, 15, 20
Curves labeled 1, 2, 3
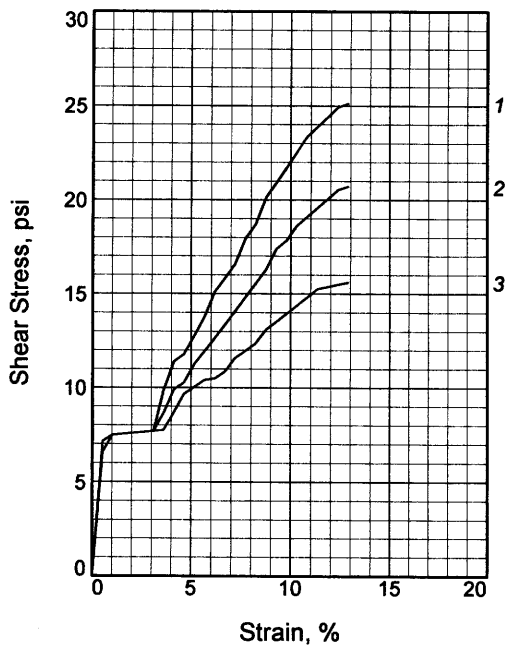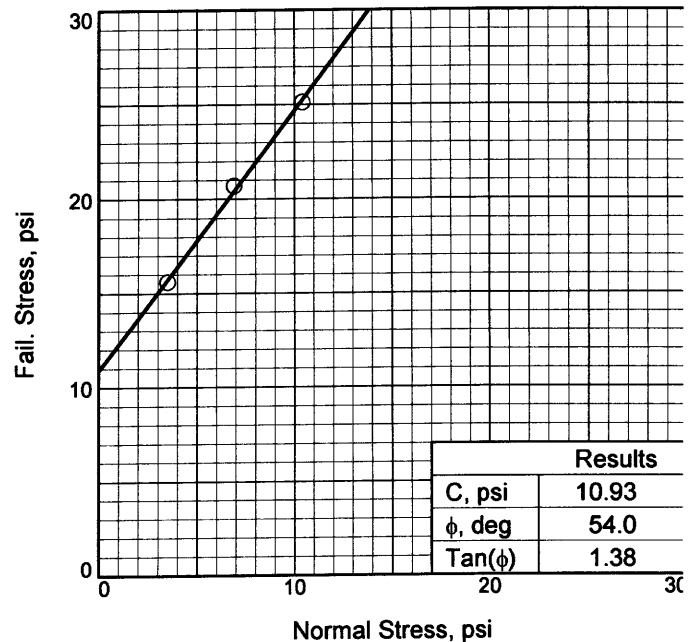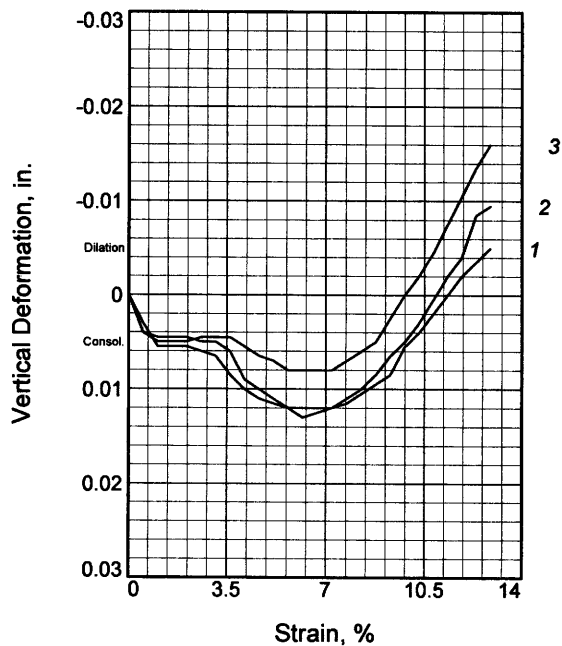
Sample No.		1	2	3
Initial	Water Content, %	8.7	8.7	8.7
	Dry Density, pcf	73.6	73.6	73.6
	Saturation, %	18.5	18.5	18.5
	Void Ratio	1.2478	1.2478	1.2478
	Diameter, in.	1.94	1.94	1.94
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	23.4	23.4	23.4
	Dry Density, pcf	73.6	73.6	73.6
	Saturation, %	49.6	49.6	49.6
	Void Ratio	1.2478	1.2478	1.2478
	Diameter, in.	1.94	1.94	1.94
	Height, in.	1.00	1.00	1.00
Normal Stress, psi		10.40	6.90	3.50
Fail. Stress, psi		25.12	20.71	15.61
Strain, %		12.9	12.9	12.9
Ult. Stress, psi				
Strain, %				
Strain rate, in./min.		0.63	0.63	0.63

Sample Type:
Description:

Assumed Specific Gravity= 2.65
Remarks:

Client:

Project: Consol Emery Coal Mine

Source of Sample: TH-1   **Depth:** 20

Proj. No.: 2850   **Date Sampled:**

Geotechnical
Engineering
Group. Inc.

Figure 17

Tested By: AI   **Checked By:** MT

ATTACHMENT C

Chemical Analyses

SGS

December 7, 2007

EarthFax Engineering Inc.
7324 South Union Park Avenue
Suite 100
Midvale Utah 84047
Ari Menitove
801-561-1861

Sample identification by

**Kind of sample
reported to us**

WASTE STOCKPILE
1 BUCKET
SAMPLE WT. 35.24 LBS.

Sample taken at

Sample taken by

Date sampled November 26, 2007

Date received November 27, 2007

ANALYSIS OF ASH	WEIGHT %, IGNITED BASIS
Silicon dioxide	52.64
Aluminum oxide	10.81
Titanium dioxide	0.51
Iron oxide	3.88
Calcium oxide	16.83
Magnesium oxide	3.68
Potassium oxide	0.82
Sodium oxide	3.63
Sulfur trioxide	6.91
Phosphorus pentoxide	0.08
Strontium oxide	0.08
Barium oxide	0.07
Manganese oxide	0.06
Undetermined	0.00
	100.00

Silica Value = 68.34   **Type of Ash =** LIGNITIC
Base:Acid Ratio = 0.45   **Fouling Index =** 3.63
T_{250} Temperature = 2355 |F   **Slagging Index =** xxxxx

Respectfully submitted.
SGS NORTH AMERICA INC

Huntington Laboratory

GENERAL CONDITIONS OF SERVICE ON REVERSE

F-466

SGS

December 7, 2007

EarthFax Engineering Inc.
7324 South Union Park Avenue
Suite 100
Midvale Utah 84047
Ari Menitove
801-561-1861

**Kind of sample
reported to us**

Sample taken at

Sample taken by

Date sampled November 26, 2007

Date received November 27, 2007

Sample identification by

WASTE STOCKPILE
1 BUCKET
SAMPLE WT. 35.24 LBS.

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	6.15	xxxxx
% Ash	39.78	42.39
% Volatile	28.09	29.93
% Fixed Carbon	25.98	27.68
	100.00	100.00
Btu/lb	7149	7617
% Sulfur	0.99	1.05
MAF Btu		13222
SO_2 lb/mill. Btu @ 100%	2.77	
Alk. as Sodium Oxide	1.66	1.77

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	6.15	xxxxx
% Carbon	41.89	44.63
% Hydrogen	3.04	3.24
% Nitrogen	0.67	0.71
% Sulfur	0.99	1.05
% Ash	39.78	42.39
% Oxygen(diff)	7.48	7.98
	100.00	100.00

Respectfully submitted
SGS NORTH AMERICA INC

Huntington Laboratory

F-465

GENERAL CONDITIONS OF SERVICE ON REVERSE

Inter-Mountain Laboratories, Inc.
1673 Terra Avenue, Sheridan, Wyoming 82801
(307) 672-8945

Report ID: S0712019001

Soil Analysis Report
SGS Minerals Services
P.O. Box 1020
Huntington, UT 84528

Date Reported: 1/10/2008
Work Order: S0712019

Project: Utah Table 6
Date Received: 12/3/2007

Lab ID	Sample ID	pH s.u.	Saturation %	Electrical Conductivity dS/m	Field Capacity %	Wilt Point %	Calcium meq/L	Magnesium meq/L	Sodium meq/L	SAR
S0712019-001	Earth Fax Coal Sample	7.6	31.0	91.0	25	10	47.2	81.8	715	89.0

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: _Karen A Secor_
Karen Secor, Soil Lab Supervisor

Inter-Mountain Laboratories, Inc.

1673 Terra Avenue, Sheridan, Wyoming 82801

(307) 672-8945

Soil Analysis Report

SGS Minerals Services
P.O. Box 1020
Huntington, UT 84528

Report ID: S0712019001

Project: Utah Table 6
Date Received: 12/3/2007

Date Reported: 1/10/2008
Work Order: S0712019

Lab ID	Sample ID	Sand %	Silt %	Clay %	Texture	Coarse Fragment %	Available Sodium meq/100g	Exchangeable Sodium meq/100g
S0712019-001	Earth Fax Coal Sample	75.0	16.0	9.0	Sandy Loam	0.09	39.0	16.9

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: _Karen A Secor_

Karen Secor, Soil Lab Supervisor

Soil Analysis Report

SGS Minerals Services
P.O. Box 1020
Huntington, UT 84528

Report ID: S0712019001

Date Reported: 1/10/2008
Work Order: S0712019

Project: Utah Table 6
Date Received: 12/3/2007

Lab ID	Sample ID	Nitrogen TKN %	Nitrate ppm	Boron ppm	Selenium ppm	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t	Total Carbon %	TOC %
S0712019-001	Earth Fax Coal Sample	0.15	<0.02	1.46	<0.02	1.31	40.9	114	73.2	40.3	39.0

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: _Karen A Secor_
Karen Secor, Soil Lab Supervisor

ATTACHMENT D

Slope Stability Analyses

Assume resultant of forces in y-direction is zero:

$$\Sigma F_y = 0$$

$$= N_i \cos\theta_i - W_i + \tau_i \sin\theta \qquad (1)$$

Solve for N_i:

$$N_i \cos\theta_i = W - \tau_i \sin\theta \qquad (2)$$

Shear on soil = sum of cohesion (c) and shear strength ($\sigma \tan\phi$)

$$\tau i = c\,\Delta x_i / (FS \cos\theta_i) + \sigma_i \tan\phi_i\, \Delta x_i / (FS \cos\theta_i) \qquad (3)$$

Normal stress (σ_i) is a function of the normal force on the slice (N_i)

$$\sigma_i = (N_i / \Delta x_i)\cos\theta_i \qquad (4)$$

Substituting (3) and (4) into (2)

$$N_i = [W_i - (c\,\Delta x_i \tan\theta) / FS] / [\cos\theta_i\,(1 + \tan\theta_i\,\tan\phi / FS)] \qquad (5)$$

Moment Equations:

$$FS = \Sigma M_{resisting} / \Sigma M_{driving} \qquad (6)$$

$\Sigma M_{driving}$ is due to the weight of the slices:

$$\Sigma M_{driving} = R\,\Sigma\,W_i \sin\theta_i$$

$\Sigma M_{resisting}$ is due to shear strength and cohesion of the slices. It can increase until the strength of the soil is exceeded (FS=1)

$$\Sigma M_{resisting} = (R / FS)\,(cL + \tan\phi\,\Sigma\,N_i) \qquad (7)$$

Substituting (5), (7), and (8) into (6):

$$FS = \Sigma\,\{ [c\Delta x_i + W \tan\phi / (\cos\theta_i + \cos\theta_i \tan\theta_i \tan\phi/FS)] \} / (\Sigma\,W_i \sin\theta_i)$$

(8)
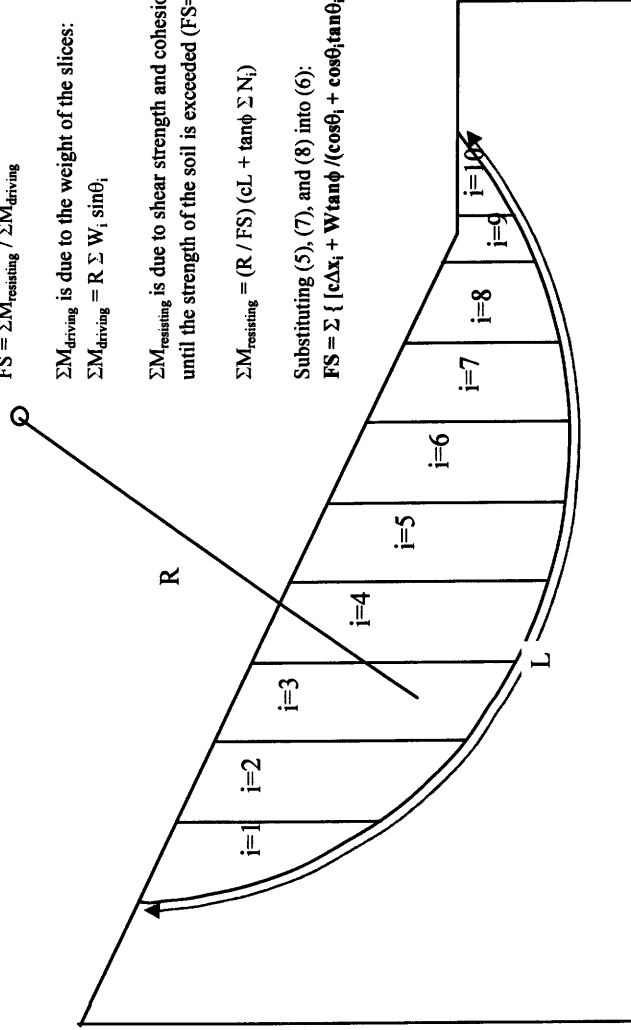
Note: Since FS is on both sides of the equation, the solution is iterative

Variables:

N = Normal force exerted on slice
θ = Inclination of base of slice
W = Weight of slice
τ = Shear stress at base of slice
Δx = Width of slice
FS = Factor of Safety
c = Soil cohesion
σ = Frictional shear stress on slice
ϕ = Soil friction angle
M = Moment
R = Length of moment arm
L = Total length of failure plane (all slices)

ILLUSTRATION OF BISHOP'S METHOD OF SLICES TO DETERMINE THE FACTOR OF SAFETY (FS) AGAINST ROTATIONAL SHEAR FAILURE
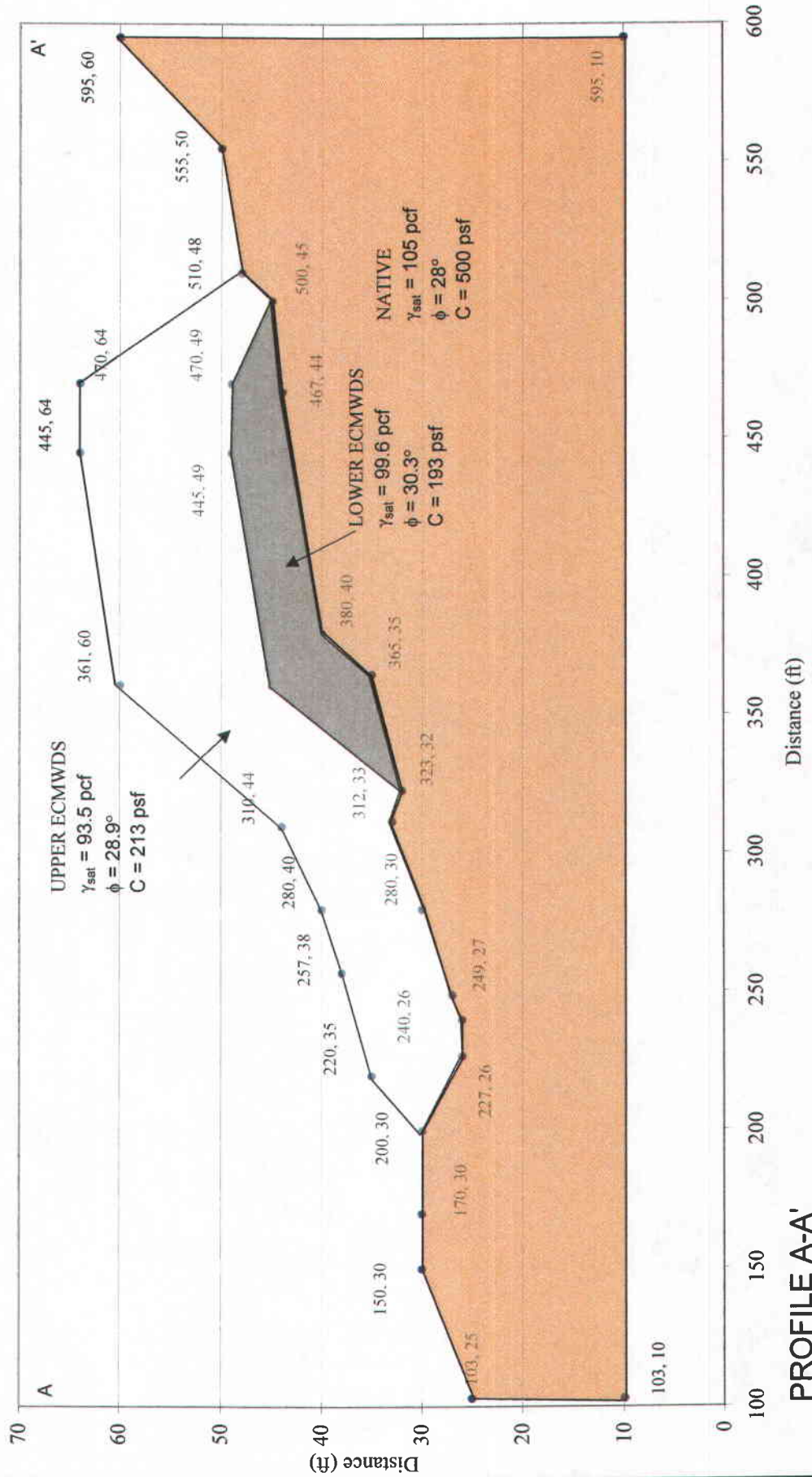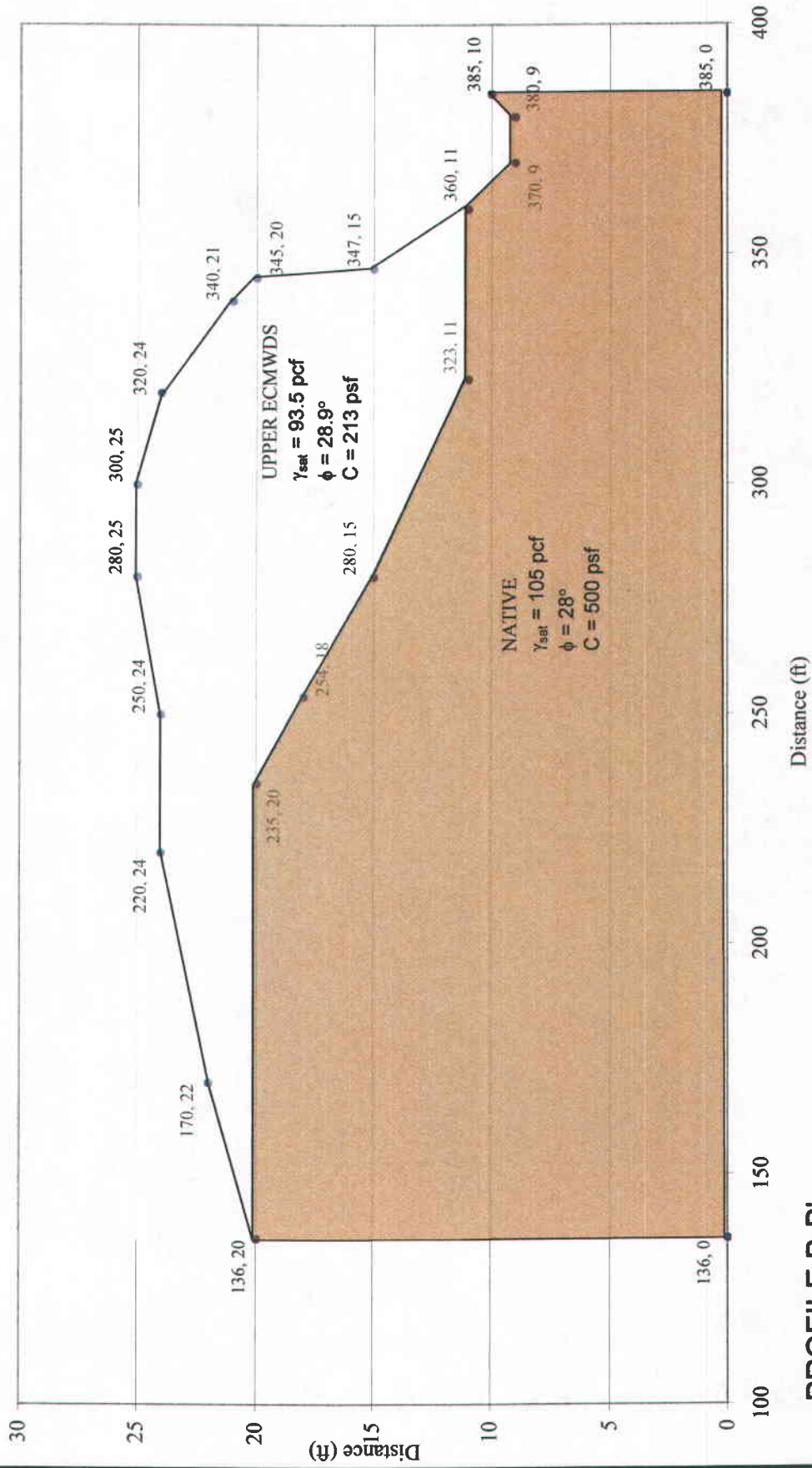
PROFILE A-A'
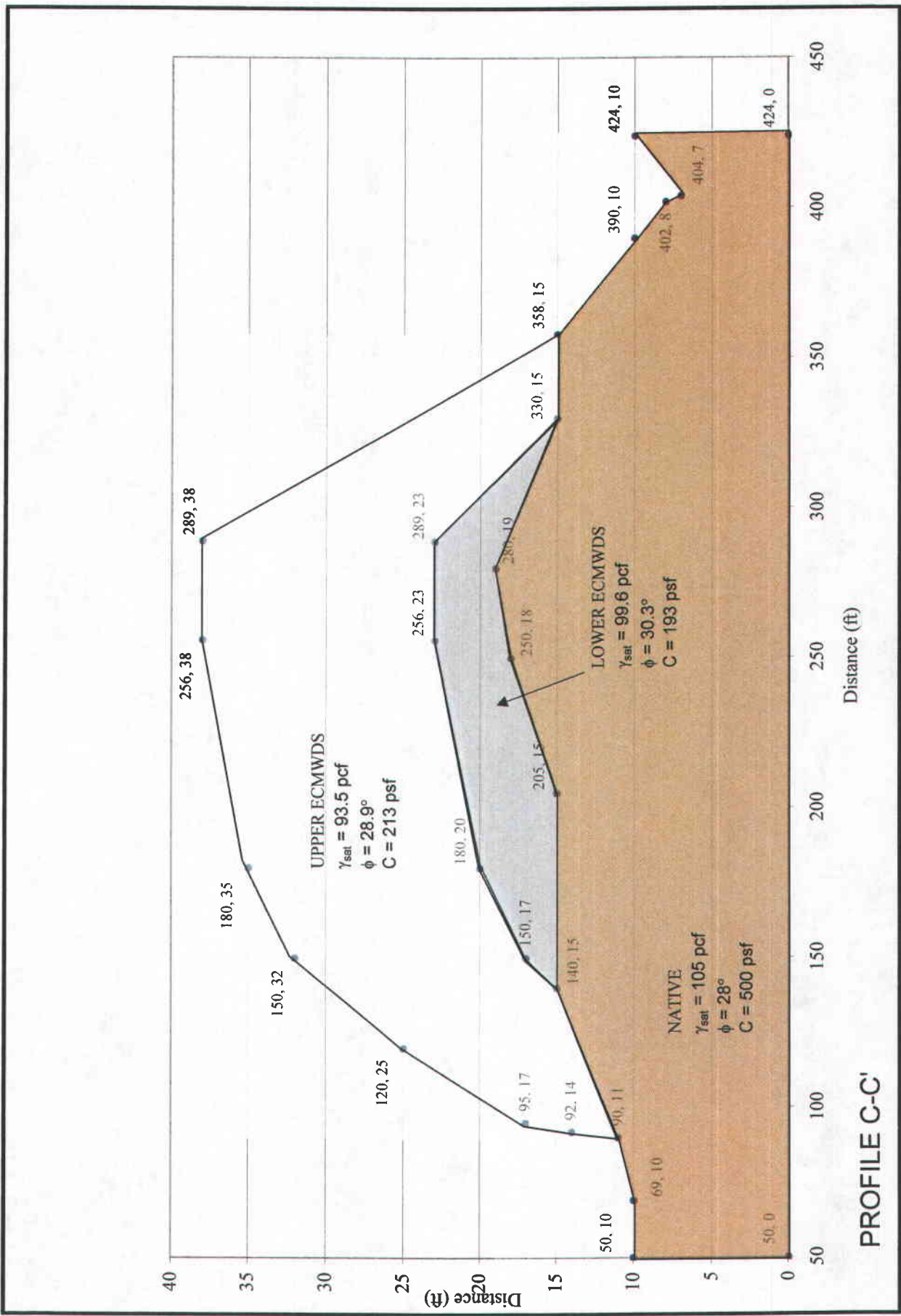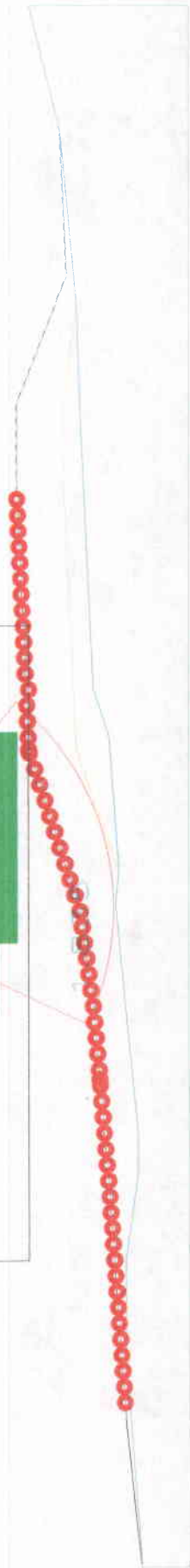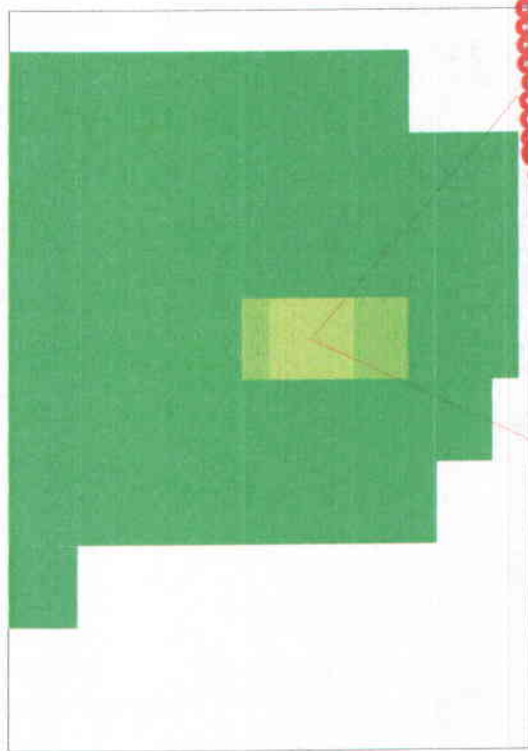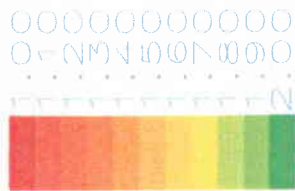
Upper ECMWDS
γ_{sat} = 93.5 pcf
ϕ = 28.9°
C = 213 psf

LOWER ECMWDS
γ_{sat} = 99.6 pcf
ϕ = 30.3°
C = 193 psf

NATIVE
γ_{sat} = 105 pcf
ϕ = 28°
C = 500 psf

Distance (ft)

Distance (ft)

PROFILE B-B'

UPPER ECMWDS
γ_{sat} = 93.5 pcf
ϕ = 28.9°
C = 213 psf

NATIVE
γ_{sat} = 105 pcf
ϕ = 28°
C = 500 psf

Distance (ft)

Distance (ft)

136, 20
170, 22
220, 24
250, 24
280, 25
300, 25
320, 24
340, 21
345, 20
347, 15
360, 11
385, 10
380, 9
370, 9
323, 11
280, 15
254, 18
235, 20
136, 0
385, 0

PROFILE C-C'

UPPER ECMWDS
γ_{sat} = 93.5 pcf
ϕ = 28.9°
C = 213 psf

LOWER ECMWDS
γ_{sat} = 99.6 pcf
ϕ = 30.3°
C = 193 psf

NATIVE
γ_{sat} = 105 pcf
ϕ = 28°
C = 500 psf

STABLE Version 9.03.00u
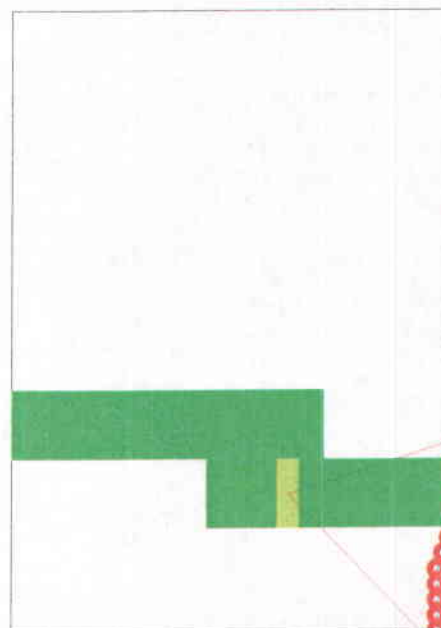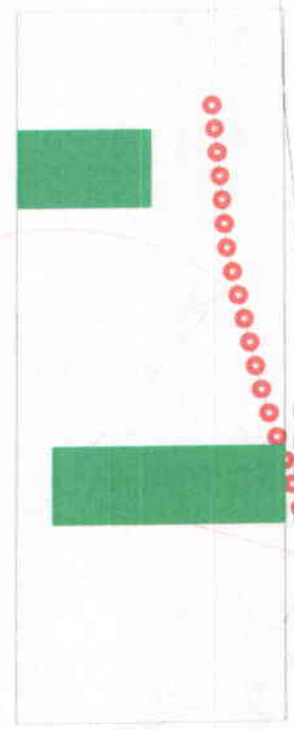
Bishop
****

TITLE
A-A' West Slope
****
UNITS (Metric/Imperial)   = I

****
GEOMETRY DEFINITION

POINTS

NO.	X	Y
1	103.000	25.000
2	150.000	30.000
3	220.000	35.000
4	257.000	38.000
5	280.000	40.000
6	310.000	44.000
7	361.000	60.000
8	445.000	64.000
9	470.000	64.000
10	510.000	48.000
11	555.000	50.000
12	595.000	60.000
13	170.000	30.000
14	200.000	30.000
15	227.000	26.000
16	240.000	26.000
17	249.000	27.000
18	280.000	30.000
19	312.000	33.000
20	323.000	32.000
21	365.000	35.000
22	380.000	40.000
23	467.000	44.000
24	500.000	45.000
25	595.000	10.000
26	103.000	10.000
45	155.000	30.360
46	160.000	30.710
47	165.000	31.070
48	170.000	31.430
49	175.000	31.790
50	180.000	32.140
51	185.000	32.500
52	190.000	32.860
53	195.000	33.210
54	200.000	33.570
55	205.000	33.930
56	210.000	34.290
57	215.000	34.640
58	225.000	35.410
59	230.000	35.810
60	235.000	36.220
61	240.000	36.620
62	245.000	37.030
63	250.000	37.430
64	255.000	37.840
65	260.000	38.260

66	265.000	38.700
67	270.000	39.130
68	275.000	39.570
69	285.000	40.670
70	290.000	41.330
71	295.000	42.000
72	300.000	42.670
73	305.000	43.330
74	315.000	45.570
75	320.000	47.140
76	325.000	48.710
77	330.000	50.270
78	335.000	51.840
79	340.000	53.410
80	345.000	54.980
81	350.000	56.550
82	355.000	58.120
83	360.000	59.690
84	365.000	60.190
85	370.000	60.430
86	375.000	60.670
87	380.000	60.010
88	385.000	61.140
89	390.000	61.380
90	395.000	61.620
91	400.000	61.860
92	405.000	62.100
93	410.000	62.330
94	415.000	62.570
95	420.000	62.810
96	425.000	63.050
97	430.000	63.290
98	435.000	63.520
99	440.000	63.760
100	361.000	45.000
101	445.000	49.000
102	470.000	49.000

LINES

Lo X	Hi X	SOIL
1	2	1
2	3	1
3	4	1
4	5	1
5	6	1
6	7	1
7	8	1
8	9	1
9	10	1
10	11	1
1	13	2
13	14	2
14	15	2
15	16	2
16	17	2
17	18	2
18	19	2
19	20	2
20	21	2
21	22	2
22	23	2
23	24	2

```
24    11    2
11    12    2
12    25    2
26    25    2
26     1    2
20   100    3
100   101    3
101   102    3
102    24    3
```

```
************************************************************
```
SOILS

SOIL	NAME	LINETYPE-PEN	COHESION	FRICTION	UNIT WT.
1	UpperRefuse	CONTINUOUS-BLACK	213.00	28.9	93.500
2	Native	CONTINUOUS-BLUE	500.00	28.0	105.000
3	LowerRefuse	CONTINUOUS-BROWN	193.00	30.3	99.600

```
************************************************************
```
PORE PRESSURE SPECIFICATION

SOIL	PIEZO Y/N/P	RU Value	EXCESS Value
1	Y	0.000	0.000
2	N	0.000	0.000
3	N	0.000	0.000

PIEZOMETRIC SURFACE

POINT

```
 2
 3
 4
 5
 6
 7
 8
 9
10
11
```

POINT PORE PRESSURES

POINT   PRESSURE


```
************************************************************
```

SLIP DIRECTION   (+/- X) = -

```
************************************************************
```
SLIP-CIRCLES

MANUAL

Circle Centre Grid Extremities

```
              200.000
             ***************
             *           *
 200.000     *           *   400.000
```

```
            *              *
            ***************
                60.000

X spacing -- no. of cols (max 10)=    10
Y spacing -- no. of rows (max 20)=    20


Grid(s)  1 - 50
     Circles tangent to line    2    3
     Circles tangent to line   13   14
     Number of tangents (Top, Bottom + Intermediate)=    50

Grid    51      Circles through point    45
Grid    52      Circles through point    46
Grid    53      Circles through point    47
Grid    54      Circles through point    48
Grid    55      Circles through point    49
Grid    56      Circles through point    50
Grid    57      Circles through point    51
Grid    58      Circles through point    52
Grid    59      Circles through point    53
Grid    60      Circles through point    54
Grid    61      Circles through point    55
Grid    62      Circles through point    56
Grid    63      Circles through point    57
Grid    64      Circles through point    58
Grid    65      Circles through point    59
Grid    66      Circles through point    60
Grid    67      Circles through point    61
Grid    68      Circles through point    62
Grid    69      Circles through point    63
Grid    70      Circles through point    64
Grid    71      Circles through point    65
Grid    72      Circles through point    66
Grid    73      Circles through point    67
Grid    74      Circles through point    68
Grid    75      Circles through point    69
Grid    76      Circles through point    70
Grid    77      Circles through point    71
Grid    78      Circles through point    72
Grid    79      Circles through point    73
Grid    80      Circles through point    74
Grid    81      Circles through point    75
Grid    82      Circles through point    76
Grid    83      Circles through point    77
Grid    84      Circles through point    78
Grid    85      Circles through point    79
Grid    86      Circles through point    80
Grid    87      Circles through point    81
Grid    88      Circles through point    82
Grid    89      Circles through point    83
Grid    90      Circles through point    84
Grid    91      Circles through point    85
Grid    92      Circles through point    86
Grid    93      Circles through point    87
Grid    94      Circles through point    88
Grid    95      Circles through point    89
Grid    96      Circles through point    90
Grid    97      Circles through point    91
Grid    98      Circles through point    92
Grid    99      Circles through point    93
Grid   100      Circles through point    94
```

```
                                    P2_1.sta
Grid  101    Circles through point   95
Grid  102    Circles through point   96
Grid  103    Circles through point   97
Grid  104    Circles through point   98
Grid  105    Circles through point   99
Grid  106    Circles through point    3
Grid  107    Circles through point    4
Grid  108    Circles through point    5
Grid  109    Circles through point    6
Grid  110    Circles through point    7
```

****
OPTIONS

TENSION CRACK (None/Dry/Wet)   = N
CRACK BASE Y COORD   =   0.000

EARTHQUAKE ACCELERATION   =   0.000

MINIMUM SLIDE MASS   =   0.000

****

POINT LOADS

POINT   ANGLE   FORCE

****
SOIL REINFORCEMENT

    POINT_A POINT_B   FORCE   PEN

****
SLICE DATA= N
****

STABLE Version 9.03.00u

Bishop
****

TITLE
A-A' East Slope
****
UNITS (Metric/Imperial)   = I

****
GEOMETRY DEFINITION

POINTS

NO.	X	Y
1	103.000	25.000
2	150.000	30.000
3	220.000	35.000
4	257.000	38.000
5	280.000	40.000
6	310.000	44.000
7	361.000	60.000
8	445.000	64.000
9	470.000	64.000
10	510.000	48.000
11	555.000	50.000
12	595.000	60.000
13	170.000	30.000
14	200.000	30.000
15	227.000	26.000
16	240.000	26.000
17	249.000	27.000
18	280.000	30.000
19	312.000	33.000
20	323.000	32.000
21	365.000	35.000
22	380.000	40.000
23	467.000	44.000
24	500.000	45.000
25	595.000	10.000
26	103.000	10.000
36	415.000	64.000
37	420.000	64.000
38	425.000	64.000
39	430.000	64.000
40	435.000	64.000
41	440.000	64.000
43	450.000	64.000
44	455.000	64.000
45	460.000	64.000
46	465.000	64.000
47	475.000	62.000
48	480.000	60.000
49	485.000	58.000
50	490.000	56.000
51	495.000	54.000
52	500.000	52.000
53	505.000	50.000
54	515.000	48.220
55	520.000	48.440
56	525.000	48.670
57	530.000	48.890

```
58    535.000    49.110
59    540.000    49.330
60    545.000    49.560
61    550.000    49.780
62    361.000    45.000
63    445.000    49.000
64    470.000    49.000
```

LINES

```
Lo X  Hi X  SOIL
  1     2     1
  2     3     1
  3     4     1
  4     5     1
  5     6     1
  6     7     1
  7     8     1
  8     9     1
  9    10     1
 10    11     1
  1    13     2
 13    14     2
 14    15     2
 15    16     2
 16    17     2
 17    18     2
 18    19     2
 19    20     2
 20    21     2
 21    22     2
 22    23     2
 23    24     2
 24    11     2
 11    12     2
 12    25     2
 26    25     2
 26     1     2
 20    62     3
 62    63     3
 63    64     3
 64    24     3
```

****
SOILS

SOIL	NAME	LINETYPE-PEN	COHESION	FRICTION	UNIT WT.
1	UpperRefuse	CONTINUOUS-BLACK	213.00	28.9	93.500
2	Native	CONTINUOUS-BLUE	500.00	28.0	105.000
3	LowerRefuse	CONTINUOUS-BROWN	193.00	30.3	99.630

****
PORE PRESSURE SPECIFICATION

SOIL	PIEZO Y/N/P	RU Value	EXCESS Value
1	Y	0.000	0.000
2	N	0.000	0.000
3	N	0.000	0.000

PIEZOMETRIC SURFACE

POINT

2
3
4
5
6
7
8
9
10
11
12

POINT PORE PRESSURES

POINT   PRESSURE

****

SLIP DIRECTION   (+/- X) = +

****
SLIP-CIRCLES

MANUAL

Circle Centre Grid Extremities

                    200.000
                ****
                *   *
    450.000   *   *   650.000
                *   *
                ****
                    60.000

X spacing -- no. of cols (max 10)=   10
Y spacing -- no. of rows (max 20)=   20

Grid   1   Circles through point   36
Grid   2   Circles through point   37
Grid   3   Circles through point   38
Grid   4   Circles through point   39
Grid   5   Circles through point   40
Grid   6   Circles through point   41
Grid   7   Circles through point   8
Grid   8   Circles through point   43
Grid   9   Circles through point   44
Grid   10   Circles through point   45
Grid   11   Circles through point   46
Grid   12   Circles through point   47
Grid   13   Circles through point   48
Grid   14   Circles through point   49
Grid   15   Circles through point   50
Grid   16   Circles through point   51
Grid   17   Circles through point   52
Grid   18   Circles through point   53
Grid   19   Circles through point   54
Grid   20   Circles through point   55
Grid   21   Circles through point   56

```
                                       P2_5.sta
Grid   22      Circles through point   57
Grid   23      Circles through point   58
Grid   24      Circles through point   59
Grid   25      Circles through point   60
Grid   26      Circles through point   61
Grid   27      Circles through point   61
Grid   28      Circles through point   61
Grid   29      Circles through point   10
Grid   30      Circles through point    9
```

****
OPTIONS

```
TENSION CRACK (None/Dry/Wet)     = N
CRACK BASE Y COORD               =      0.000

EARTHQUAKE ACCELERATION          =      0.000

MINIMUM SLIDE MASS               =      0.000
```

****

POINT LOADS

POINT   ANGLE   FORCE

****
SOIL REINFORCEMENT

```
    POINT_A  POINT_B     FORCE   PEN
```

****
SLICE DATA= N
****

STABLE Version 9.03.00u

Bishop
****

TITLE
B-B' North Slope Surface Points
****
UNITS (Metric/Imperial)   = I

****
GEOMETRY DEFINITION

POINTS

NO.	X	Y
1	136.000	20.000
2	170.000	22.000
3	220.000	24.000
4	250.000	24.000
5	280.000	25.000
6	300.000	25.000
7	320.000	24.000
8	340.000	21.000
9	345.000	20.000
10	347.000	15.000
11	360.000	11.000
12	235.000	20.000
13	254.000	18.000
14	280.000	15.000
15	323.000	11.000
16	370.000	9.000
17	380.000	9.000
18	385.000	10.000
19	385.000	0.000
20	136.000	0.000
26	302.000	24.900
27	304.000	24.800
28	306.000	24.700
29	308.000	24.600
30	310.000	24.500
31	312.000	24.400
32	314.000	24.300
33	316.000	24.200
34	318.000	24.100
35	322.000	23.700
36	324.000	23.400
37	326.000	23.100
38	328.000	22.800
39	330.000	22.500
40	332.000	22.200
41	334.000	21.900
42	336.000	21.600
43	338.000	21.300
44	342.000	20.600
45	344.000	20.200
46	348.000	14.690
47	350.000	14.080
48	352.000	13.460
49	354.000	12.850
50	356.000	12.230
51	358.000	11.620
52	362.000	10.600

```
      53    364.000    10.200
      54    366.000     9.800
      55    368.000     9.400
```

LINES

```
  Lo X   Hi X   SOIL
      1      2      1
      2      3      1
      3      4      1
      5      6      1
      6      7      1
      7      8      1
      8      9      1
      9     10      1
     10     11      1
      4      5      1
     11     16      2
     20      1      2
      1     12      2
     12     13      2
     13     14      2
     14     15      2
     15     11      2
     16     17      2
     17     18      2
     18     19      2
     20     19      2
```

****
SOILS

SOIL	NAME	LINETYPE-PEN	COHESION	FRICTION	UNIT WT.
1	UpperRefuse	CONTINUOUS-RED	213.00	28.9	93.500
2	Native	CONTINUOUS-BLUE	500.00	28.0	105.000

****
PORE PRESSURE SPECIFICATION

SOIL	PIEZO Y/N/P	RU Value	EXCESS Value
1	Y	0.000	0.000
2	N	0.000	0.000

PIEZOMETRIC SURFACE

 POINT

```
      1
      2
      3
      4
      5
      6
      7
      8
      9
     10
     11
```

POINT PORE PRESSURES

POINT PRESSURE

****

SLIP DIRECTION (+/- X) = +

****
SLIP-CIRCLES

MANUAL

Circle Centre Grid Extremities

```
                    75.000
              ***************
              *             *
   300.000    *             *    375.000
              *             *
              ***************
                    15.000
```

X spacing -- no. of cols (max 10)=   10
Y spacing -- no. of rows (max 20)=   20

Grid   1   Circles through point   26
Grid   2   Circles through point   27
Grid   3   Circles through point   28
Grid   4   Circles through point   29
Grid   5   Circles through point   30
Grid   6   Circles through point   31
Grid   7   Circles through point   32
Grid   8   Circles through point   33
Grid   9   Circles through point   34
Grid   10   Circles through point   35
Grid   11   Circles through point   36
Grid   12   Circles through point   37
Grid   13   Circles through point   38
Grid   14   Circles through point   39
Grid   15   Circles through point   40
Grid   16   Circles through point   41
Grid   17   Circles through point   42
Grid   18   Circles through point   43
Grid   19   Circles through point   44
Grid   20   Circles through point   45
Grid   21   Circles through point   46
Grid   22   Circles through point   47
Grid   23   Circles through point   48
Grid   24   Circles through point   49
Grid   25   Circles through point   50
Grid   26   Circles through point   51
Grid   27   Circles through point   52
Grid   28   Circles through point   53
Grid   29   Circles through point   54
Grid   30   Circles through point   55
Grid   31   Circles through point   55
Grid   32   Circles through point   6
Grid   33   Circles through point   7
Grid   34   Circles through point   8
Grid   35   Circles through point   9
Grid   36   Circles through point   10
Grid   37   Circles through point   11

```
************************************************************
OPTIONS

TENSION CRACK (None/Dry/Wet)    = N
CRACK BASE Y COORD              =       0.000

EARTHQUAKE ACCELERATION         =       0.000

MINIMUM SLIDE MASS              =       0.000

************************************************************

POINT LOADS

POINT    ANGLE         FORCE

************************************************************
SOIL REINFORCEMENT

    POINT_A   POINT_B      FORCE    PEN

************************************************************
SLICE DATA= N
************************************************************
```

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Bishop
****

TITLE
C-C' North Slope
****
UNITS (Metric/Imperial)   = I

****
GEOMETRY DEFINITION

POINTS

NO.	X	Y
1	50.000	10.000
2	69.000	10.000
3	92.000	14.000
4	95.000	17.000
5	120.000	25.000
6	150.000	32.000
7	180.000	35.000
8	256.000	38.000
9	289.000	38.000
10	358.000	15.000
11	390.000	10.000
12	402.000	8.000
13	404.000	7.000
14	424.000	10.000
15	90.000	11.000
16	140.000	15.000
17	205.000	15.000
18	250.000	18.000
19	280.000	19.000
20	330.000	15.000
21	424.000	0.000
22	50.000	0.000
23	255.000	38.000
24	260.000	38.000
25	265.000	38.000
26	270.000	38.000
27	275.000	38.000
28	280.000	38.000
29	285.000	38.000
30	290.000	37.670
31	295.000	36.000
32	300.000	34.330
33	305.000	32.670
34	310.000	31.000
35	315.000	29.330
36	320.000	27.670
37	325.000	26.000
38	330.000	24.330
39	335.000	22.670
40	340.000	21.000
41	345.000	19.330
42	350.000	17.670
43	355.000	16.000
44	360.000	14.690
45	365.000	13.910
46	370.000	13.130
47	375.000	12.340

```
48    380.000    11.560
49    385.000    10.780
50    150.000    17.000
51    180.000    20.000
52    256.000    23.000
53    289.000    23.000
```

LINES

```
Lo X   Hi X   SOIL
  2      3      1
  3      4      1
  4      5      1
  5      6      1
  6      7      1
  7      8      1
  8      9      1
  9     10      1
 10     11      1
 22      1      2
  1      2      2
  2     15      2
 15     16      2
 16     17      2
 17     18      2
 18     19      2
 19     20      2
 20     11      2
 11     12      2
 12     13      2
 13     14      2
 14     21      2
 22     21      2
 16     50      3
 50     51      3
 51     52      3
 52     53      3
 53     20      3
```

****
SOILS

SOIL	NAME	LINETYPE-PEN	COHESION	FRICTION	UNIT WT.
1	UpperRefuse	CONTINUOUS-RED	213.00	28.9	93.500
2	Native	CONTINUOUS-BLUE	500.00	28.0	105.000
3	LowerRefuse	CONTINUOUS-BLACK	193.00	30.3	99.600

****
PORE PRESSURE SPECIFICATION

SOIL	PIEZO Y/N/P	RU Value	EXCESS Value
1	Y	0.000	0.000
2	N	0.000	0.000
3	N	0.000	0.000

PIEZOMETRIC SURFACE

POINT

```
 2
 3
```

```
     4
     5
     6
     7
     8
     9
    10
    11
```

POINT PORE PRESSURES

POINT   PRESSURE

****

SLIP DIRECTION   (+/- X) = +

****
SLIP-CIRCLES

MANUAL

Circle Centre Grid Extremities

```
                 100.000
                ***************
                *             *
  275.000       *             *      375.000
                *             *
                ***************
                 20.000
```

X spacing -- no. of cols (max 10)=   10
Y spacing -- no. of rows (max 20)=   20

Grid   1   Circles through point   23
Grid   2   Circles through point   24
Grid   3   Circles through point   25
Grid   4   Circles through point   26
Grid   5   Circles through point   27
Grid   6   Circles through point   28
Grid   7   Circles through point   29
Grid   8   Circles through point   30
Grid   9   Circles through point   31
Grid   10   Circles through point   32
Grid   11   Circles through point   33
Grid   12   Circles through point   34
Grid   13   Circles through point   35
Grid   14   Circles through point   36
Grid   15   Circles through point   37
Grid   16   Circles through point   38
Grid   17   Circles through point   39
Grid   18   Circles through point   40
Grid   19   Circles through point   41
Grid   20   Circles through point   42
Grid   21   Circles through point   43
Grid   22   Circles through point   44
Grid   23   Circles through point   45
Grid   24   Circles through point   46
Grid   25   Circles through point   47
Grid   26   Circles through point   48

```
                                    P2_9.sta
Grid  27      Circles through point   49
Grid  28      Circles through point    9
Grid  29      Circles through point   10

************************************************************
OPTIONS

TENSION CRACK (None/Dry/Wet)     = N
CRACK BASE Y COORD               =       0.000

EARTHQUAKE ACCELERATION          =       0.000

MINIMUM SLIDE MASS               =       0.000

************************************************************

POINT LOADS

POINT   ANGLE        FORCE

************************************************************
SOIL REINFORCEMENT

    POINT_A   POINT_B     FORCE    PEN

************************************************************
SLICE DATA= N
************************************************************
```

STABLE Version 9.03.00u

Bishop
****

TITLE
C-C' South Slope
****
UNITS (Metric/Imperial)   = I

****
GEOMETRY DEFINITION

POINTS

NO.	X	Y
1	50.000	10.000
2	69.000	10.000
3	92.000	14.000
4	95.000	17.000
5	120.000	25.000
6	150.000	32.000
7	180.000	35.000
8	256.000	38.000
9	289.000	38.000
10	358.000	15.000
11	390.000	10.000
12	402.000	8.000
13	404.000	7.000
14	424.000	10.000
15	90.000	11.000
16	140.000	15.000
17	205.000	15.000
18	250.000	18.000
19	280.000	19.000
20	330.000	15.000
21	424.000	0.000
22	50.000	0.000
23	55.000	10.000
24	60.000	10.000
25	65.000	10.000
26	70.000	10.170
27	75.000	11.040
28	80.000	11.910
29	85.000	12.780
30	90.000	13.650
31	100.000	18.600
32	105.000	20.200
33	110.000	21.800
34	115.000	23.400
35	125.000	26.170
36	130.000	27.330
37	135.000	28.500
38	140.000	29.670
39	145.000	30.830
40	155.000	32.500
41	160.000	33.000
42	165.000	33.500
43	170.000	34.000
44	175.000	34.500
45	150.000	17.000
46	180.000	20.000
47	256.000	23.000

         48   289.000   23.000

LINES

```
Lo X  Hi X   SOIL
   2     3      1
   3     4      1
   4     5      1
   5     6      1
   6     7      1
   7     8      1
   8     9      1
   9    10      1
  10    11      1
  22     1      2
   1     2      2
   2    15      2
  15    16      2
  16    17      2
  17    18      2
  18    19      2
  19    20      2
  20    11      2
  11    12      2
  12    13      2
  13    14      2
  14    21      2
  22    21      2
  16    45      3
  45    46      3
  46    47      3
  47    48      3
  48    20      3
```

****
SOILS

SOIL	NAME	LINETYPE-PEN	COHESION	FRICTION	UNIT WT.
1	UpperRefuse	CONTINUOUS-RED	213.00	28.9	93.500
2	Native	CONTINUOUS-BLUE	500.00	28.0	105.000
3	LowerRefuse	CONTINUOUS-BLACK	193.00	30.3	99.600

****
PORE PRESSURE SPECIFICATION

SOIL	PIEZO Y/N/P	RU Value	EXCESS Value
1	Y	0.000	0.000
2	N	0.000	0.000
3	N	0.000	0.000

PIEZOMETRIC SURFACE

 POINT

    2
    3
    4
    5
    6
    7
    8

```
         9
        10
        11
```

POINT PORE PRESSURES

POINT   PRESSURE

****

SLIP DIRECTION (+/- X) = -

****
SLIP-CIRCLES

MANUAL

Circle Centre Grid Extremities

```
                   75.000
            ***************
            *             *
  50.000    *             *   200.000
            *             *
            ***************
                   20.000
```

```
X spacing -- no. of cols (max 10)=   10
Y spacing -- no. of rows (max 20)=   20
```

```
Grid     1     Circles through point    23
Grid     2     Circles through point    24
Grid     3     Circles through point    25
Grid     4     Circles through point    26
Grid     5     Circles through point    27
Grid     6     Circles through point    28
Grid     7     Circles through point    29
Grid     8     Circles through point    30
Grid     9     Circles through point    31
Grid    10     Circles through point    32
Grid    11     Circles through point    33
Grid    12     Circles through point    34
Grid    13     Circles through point    35
Grid    14     Circles through point    36
Grid    15     Circles through point    37
Grid    16     Circles through point    38
Grid    17     Circles through point    39
Grid    18     Circles through point     2
Grid    19     Circles through point     3
Grid    20     Circles through point     4
Grid    21     Circles through point     5
Grid    22     Circles through point     6
Grid    23     Circles through point    40
Grid    24     Circles through point    41
Grid    25     Circles through point    42
Grid    26     Circles through point    43
Grid    27     Circles through point    44
Grid    28     Circles through point     7
```

****
OPTIONS

```
TENSION CRACK (None/Dry/Wet)      = N
CRACK BASE Y COORD                =        0.000

EARTHQUAKE ACCELERATION           =        0.000

MINIMUM SLIDE MASS                =        0.000

*********************************************************

POINT LOADS

POINT    ANGLE        FORCE

*********************************************************
SOIL REINFORCEMENT

    POINT_A   POINT_B      FORCE    PEN

*********************************************************
SLICE DATA= N
*********************************************************
```

APPENDIX VII-2

TOPSOIL SUBSTITUTION PLAN

PERMANENT UNDERGROUND DEVELOPMENT WASTE DISPOSAL SITE

The permanent underground development waste disposal site will involve the burial of wastes presently located on the northwest coal stockpile (existing coal mine waste disposal site) and of wastes generated in the future. The disposal site is located on the hilltop adjacent to the northwest coal stockpile area and has been previously disturbed. The disturbances involved the removal of a gravel subsoil layer for use as fill material during construction of the northwest coal stockpile site and as fill outside the mine area. These activities created borrow pits on both sides of the access road that crosses the proposed disposal site. The site will be developed in two stages with the area south of the road used first. The existing pit will be enlarged and deepened by removing the gravel layer down to the underlying bluegate shale, if necessary, to provide sufficient storage volume. The cut material will be stockpiled on the north side of the road to be used as non-toxic cover material for the waste. Excess cut material will be placed in the bermed depression west of the office. A safety berm will be built on the south side of the access road as the pit advances toward the road. The road will be temporarily relocated to the north to allow for disposal underneath. The road will then be returned to its original location and grade after that part of the disposal site is filled. The north portion of the site will be similarly developed. The wastes will be placed and compacted using tracked and rubber tired equipment.

Wastes - Characterization

The mine development wastes are generally produced from roof falls and projects that enlarge entries near the portal areas. The decision to remove these materials from the mine is based on the safety hazard that they present. In order to identify any toxic materials, the wastes that are currently stored on the northwest coal stockpile location (existing coal mine waste disposal site) were sampled on September 15, 1986. The laboratory results given in Table A show that these materials have a pH range of 4.2 - 8.2 and a net neutralization potential range of -54.8 to 121.0 gCaCo3/Kg soil.

The fifteen (15) samples taken in 1986 were randomly collected from the waste pile. The sum of the analytical results yield a net positive 24.2 grams of calcium carbonate per kilogram of soil. Future wastes are not expected to differ significantly from those presently stored since no changes in the mining methods or operation are planned. Refer to CH II, pg 20 and CH V Section V.A.4 for a discussion on roof and floor characteristics (underground development waste) and Section V,A,5 for a discussion of acid, alkaline, toxic potential. Also refer to CH VI section VI.2.8.3 (PHC) for a similar discussion. Refer to CHIV pg. 21 for waste characterization of the original material, and CH IV, App IV-9 for current analysis

Revised 2/08

CH VII, APP VII-2, page 1

Cover Material

Based upon differences in soil quality shown in Table V, Consol proposes to segregate the cover material into two stockpiles according to the following procedures. Topsoil materials found in the top zone of the project area and identified by soil sample #3 will be mixed and stored with the middle zone materials identified by soil sample #2. Materials from the bottom zone that are identified by soil sample #1 will be stored apart from the top and middle zone materials. The stockpile consisting of the top and middle zone materials will be identified as a topsoil stockpile while the stockpile of bottom zone materials will be identified as a subsoil stockpile. Prior to construction of the Permanent Waste Disposal Site, Consol will resample the site for topsoil substitute quality and quantity, and cover material quality. The site will be sampled on one sample per acre grid, with analysis on one foot intervals for the first five feet and five foot intervals for the remaining depth.

Operations and Reclamation

Excess cut material will be conveyed and placed in the bermed depression west of the office building. This material will be used to fill in and extend the parking area next to the office. The excess fill will be compacted and stabilized.

The stored wastes (existing coal mine waste disposal site) will then be conveyed from the northwest coal storage area to the excavated disposal site(permanent underground development waste disposal site), placed in the southwest end of the site, compacted and covered with four feet of stockpiled cut material.

During backfill operations, the lower zone soil material will be backfilled over the disposed underground development waste first. Then the mixed upper and middle zone soil material will be placed over the lower zone soil material. Placement of the wastes will proceed from the southwest end towards the service road until all of the temporarily stored wastes have been buried. The completed fill will then be covered, graded to its final contour and seeded. Sufficient disposal capacity will remain active to accommodate about 500 cu. yds. (approximately one year's volume) of future wastes. Consol will treat and/or otherwise place all potentially acid or toxic forming underground development waste in the disposal site within 30 days after it is first exposed on the mine site. The remaining site will be developed on an as needed basis with the road being temporarily relocated to the north and returned to its original location and graded when the site has been completed through that point. In order to reclaim the active site sufficient cover material will be maintained in a stockpile either ahead of or behind the fill.

Revised 2/08

DRAINAGE DITCH DESIGN

The drainage ditch designs consist of, in general, a narrative description, design parameters, flow calculations, flowline profile and cross-section for each ditch. The design parameters include drainage area, design storm information, curve number and channel dimensions. Due to the relatively large size of their drainage areas, flow calculations are used to derive the design peak flow rate for each diversion. The design peak flows for the smaller Ditches No. 1 through No. 5 are approximated using SCS peak flow rate graphs or modeled using HEC-HMS computer program. This information is then used within Manning's Equation to determine the specific flow characteristics of each ditch.

The design storms used for the ditches are: 10-year/24-hour for temporary ditches not associated with refuse disposal areas and 100-year/24-hour for the permanent Stream Diversion and Waste Disposal Site Diversion. Ditches conveying drainage from the surface of refuse piles are designed using the 100-year/6-hour storm event. The ditches are designed to maintain flow velocities during design storm peak flows under 4.0 fps in earthen channels and less than 12 fps in rock. In earthen channels where gradient slopes result in peak velocities exceeding 4.0 fps, rock checks and/or other stabilizing structures will be installed to mitigate erosion. Side slopes will be constructed with slopes of 2H:1V or flatter in earthen channels and 1H:1V or flatter in rock. Channel bottoms will be controlled with rock riprap where deemed necessary. The ditch spoil will be graded and seeded as soon as possible. These measures will serve to reduce erosion of the spoil and the sediment load in the ditch conveyance. See Plate VI-10 for drainage ditch locations.

TEMPORARY DITCH NO. 1

Ditch No. 1 collects runoff from a small drainage area north of the Existing Coal Stockpile/Coal Mine Waste (Stockpile/Disposal Site) conveying it west and then south to a confluence with Temporary Ditch No. 2. The ditch parallels Ditch No. 2 but at a lower elevation. Drainage area to Ditch No. 1 consists of the out slope of the berm forming Ditch No. 2 as well as some undisturbed area. Runoff from the Stockpile/Disposal Site does not enter Ditch No. 1. Total drainage area to Ditch No. 1 is 1.1 acres.

Since this ditch does not convey refuse area drainage and would be classified as a miscellaneous ditch, the 2-year, 6-hour storm event is required for the design per Utah regulation 742.333. However, Ditch No. 1 is included in the HEC-HMS 100-year, 6-hour computer model for Ditch No. 2 since it combines with Ditch No. 2 before discharging to Pond 8. If flow depths and velocities are adequate using the 100-year event, the ditch would also be adequate for the 2-year, 6-hour event.

Ditch No. 1 consists of a steep section and a flat section (Ditches 1A and 1B), respectively. A portion of Ditch 1A is a natural drainage channel and a portion is excavated as shown on *Figure VI-27*. The drainage area for Ditch 1A is designated as HYDD-1 in the HEC-HMS model and the area for Ditch 1B is HYDD-2. From the HEC-HMS model, flows for the sections are 0.6 cfs and 1.1 cfs. Both sections are modeled as triangular even though some areas have a small bottom width. The sections have 4:1 side slopes and a Manning's "n" of 0.030. The steep section has a flow gradient of 0.048 feet/foot (ft/ft) and the gradient for the flat section is 0.009 ft/ft.

Using Manning's Open Channel Flow Equation:

$$Q = \frac{1.49}{n} (A)(R)^{2/3}(s)^{0.5}$$

where A = area (ft^2)
R = area/wetted perimeter
s = ditch gradient

From trial and error, flow depth and velocity for each section are:

Ditch 1A Steep section – 0.25-foot flow depth at 2.6 fps
Ditch 1B Flat section – 0.42-foot flow depth at 1.6 fps

Ditch No. 1 is adequately sized for the 100-year event and is, therefore, adequate for the 2-year event. See *Figures VI-27, 27A,* and *27B* for profile and cross section of Ditch No. 1. The *Pond No. 8, Plan View and Drainage Map, Operations Phase* in *Appendix VI-7* shows the plan view of this structure. Flow for this ditch will not change during the reclamation phase.

TEMPORARY DITCH NO. 2

Ditch No. 2 intercepts runoff from the Stockpile/Disposal Site and conveys it to Culvert B after combining with discharge from Ditch No. 1. Discharge from Culvert B is directed to Sediment Pond No. 8 via Culvert C. Total drainage area for Ditch No. 2 is 6.2 acres. The 100-year, 6-hour storm event is used to design the ditch per Utah Department of Natural Resources regulations 746.212.

The ditch consists of three sections designated Ditches 2A, 2B, and 2C. Ditch 2A intercepts runoff from the east and north sides of the disposal area. An undisturbed portion of this drainage area (Area A on the *Pond No. 8, Plan View and Drainage Map, Operations Phase* in *Appendix VI-7*) lies east of the refuse area. Runoff from Area A is shown as HYD2A on the HEC-HMS computer model. Area B (HYD2B) consists of the east and north out slopes of the refuse pile. Total drainage area for Ditch 2A is 2.0 acres. Ditch 2A has a bottom width of 2 feet with 2:1 side slopes and a flow gradient averaging 0.0425 ft/ft. Peak flow in this section from the HMS model is 3.3 cfs. This flow is routed through the next section (Ditch 2B).

Ditch 2B intercepts drainage from Area C (HYD2C) consisting of the south and west sides of the refuse pile and the coal stockpile area. The top of the waste disposal pile has been graded to direct runoff to the south and avoid the steeper ditch section (Ditch 2A). The peak flow from Ditch 2A and runoff from Area C is 10.8 cfs. Ditch 2B has a bottom width of 2 feet with 2:1 side slopes and a flow gradient of 0.0068 ft/ft. A rock-lined channel at the end of Ditch 2B conveys the flow down a slope to Ditch 2C, combining with discharge from Ditch No. 1.

Peak flow for Ditch 2C is 11.9 cfs. Ditch 2C has a 3-foot bottom width with 2:1 side slopes and a 0.029 ft/ft flow gradient. The channel is cut in bedrock, making it adequate for flow velocities less than 10 fps.

At the end of mine operations, the coal mine waste disposal pile will be transferred to the Permanent Development Waste Disposal Site as shown on *Pond No. 8, Plan View and Drainage Map, Reclamation Phase*. When this site is developed, the flow characteristics of the drainage area to Ditch No. 2 will change and increase the peak flow slightly. The drainage area to Culvert C from Area E will also increase. Since flows during this phase will be slightly higher than during the operations phase, the HEC-HMS model assumes drainage areas and watershed parameters from the reclamation phase.

Flow depths and velocities are calculated using Manning's Open Channel Flow Equation.

$$Q = \frac{1.49}{n} (A) (R)^{2/3} (s)^{0.5}$$

where
A = area (ft^2)
R = area/wetted perimeter
s = ditch gradient
n = roughness factor (0.030)

Using trial and error, flow depths and velocities are:

Ditch 2A – 0.3-foot flow depth at 4.0 fps
Ditch 2B – 1.0-foot flow depth at 2.9 fps
Ditch 2C – 0.6-foot flow depth at 4.9 fps

See *Figures VI-27, 27A,* and *27B* for profile and cross sections of Ditch No. 2. The *Pond No. 8, Plan View and Drainage Map* in *Appendix VI-7* shows the plan view of this structure.

CULVERT B

Culvert B is an existing 24-inch corrugated metal pipe (CMP) conveying drainage from Ditch No. 2 under the road to the Stockpile/Disposal Site. Invert elevation of the pipe is 5939.6 and the top of road/top of ditch elevation is 5943.2, allowing a flow depth of 3.6 feet before overtopping.

From the HEC-HMS computer model for Ditches 1 and 2, the 100-year, 6-hour event peak flow to Culvert B is 11.9 cfs. A series of discharges to headwater depths from the nomograph shown below were input into the model. From the nomograph and HEC-HMS output, the headwater depth required to achieve 11.9 cfs is 2.0 feet. The culvert is, therefore, adequate to convey the peak discharge without overtopping.


**HEADWATER DEPTH FOR
C. M. PIPE CULVERTS
WITH INLET CONTROL**
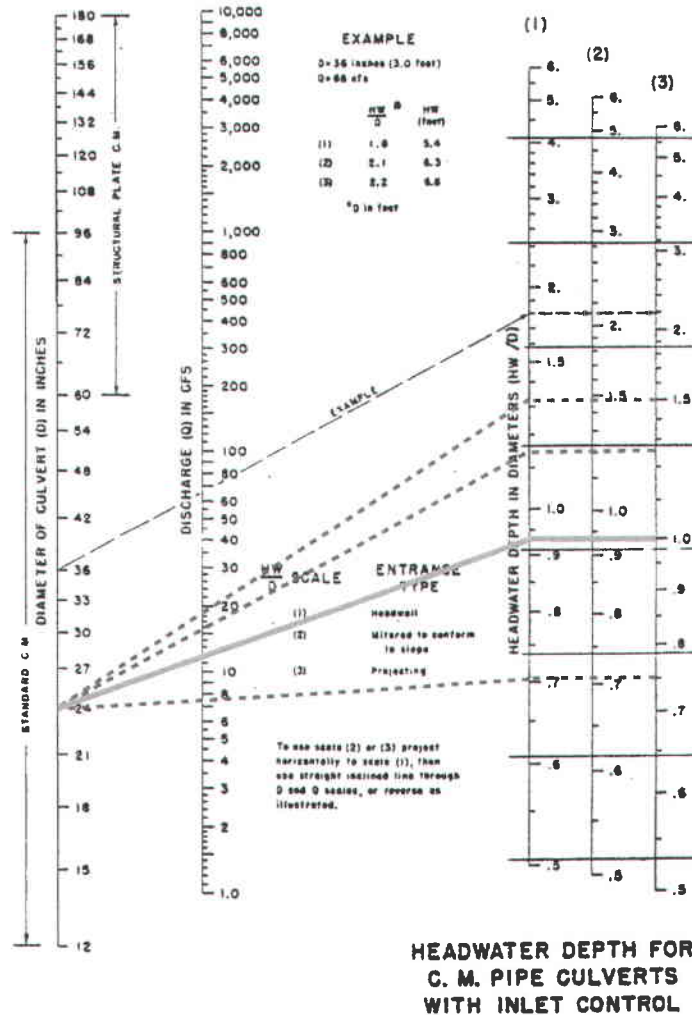
(From Ref. Hyd. Eng. Circular No. 5, USBRP, 1965)

CULVERT C

Culvert C is an existing 24-inch CMP conveying drainage from Culverts A and B and runoff from Area E. Invert elevation of the pipe is 5926.7 and the top of road/top of ditch elevation is 5931, allowing a pool depth of 4.3 feet before overtopping. An existing leach field lays upgradient from Culvert C and provides temporary storage during precipitation events.

From the HEC-HMS computer model, the 100-year, 6-hour event peak flow to Culvert C is 24.5 cfs. A series of discharges to headwater depths from the nomograph shown below were input into the model. From the nomograph and HEC-HMS output, the headwater depth peaks at 2.6 feet with a peak flow of 16.2 cfs. The culvert is, therefore, adequate to convey the peak discharge without overtopping.


**HEADWATER DEPTH FOR
C. M. PIPE CULVERTS
WITH INLET CONTROL**
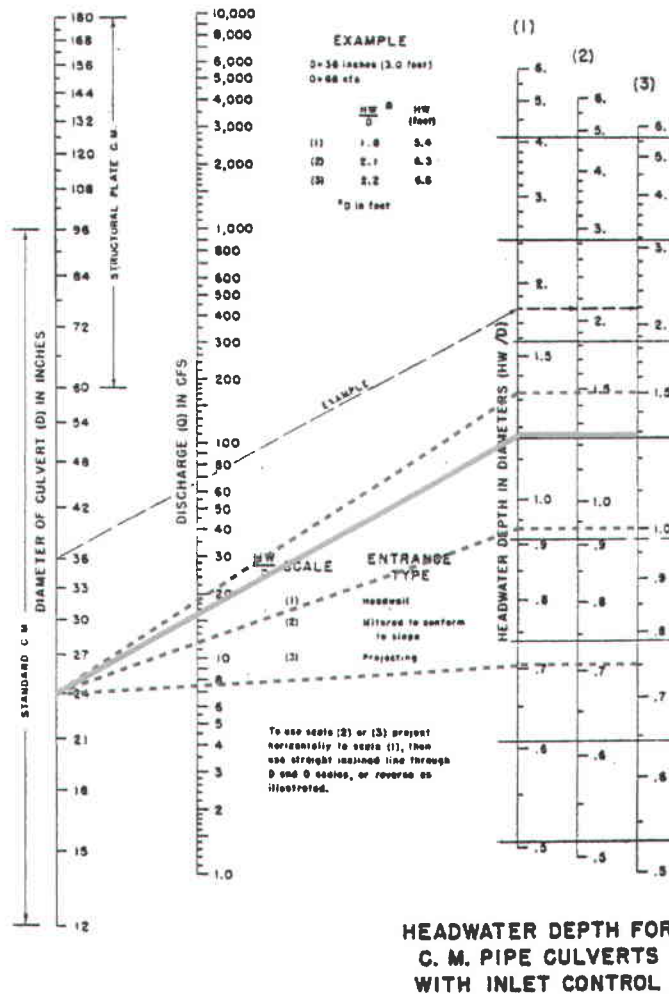
(From Ref. Hyd. Eng. Circular No. 5, USBRP, 1965)

CULVERT D

Culvert D is an existing 18-inch CMP conveying runoff from a small unaffected area (Area G). Invert elevation of the pipe is 5924.6 and the top of road/top of ditch elevation is 5929.1, allowing a pool depth of 4.5 feet before overtopping.

From the HEC-HMS computer model, the 100-year, 6-hour event peak flow to Culvert D is 0.7 cfs. A series of discharges to headwater depths from the nomograph shown below were input into the model. From HEC-HMS output, the headwater depth required to achieve 0.7 cfs is 0.2 feet. The culvert is, therefore, adequate to convey the peak discharge without overtopping.


HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL
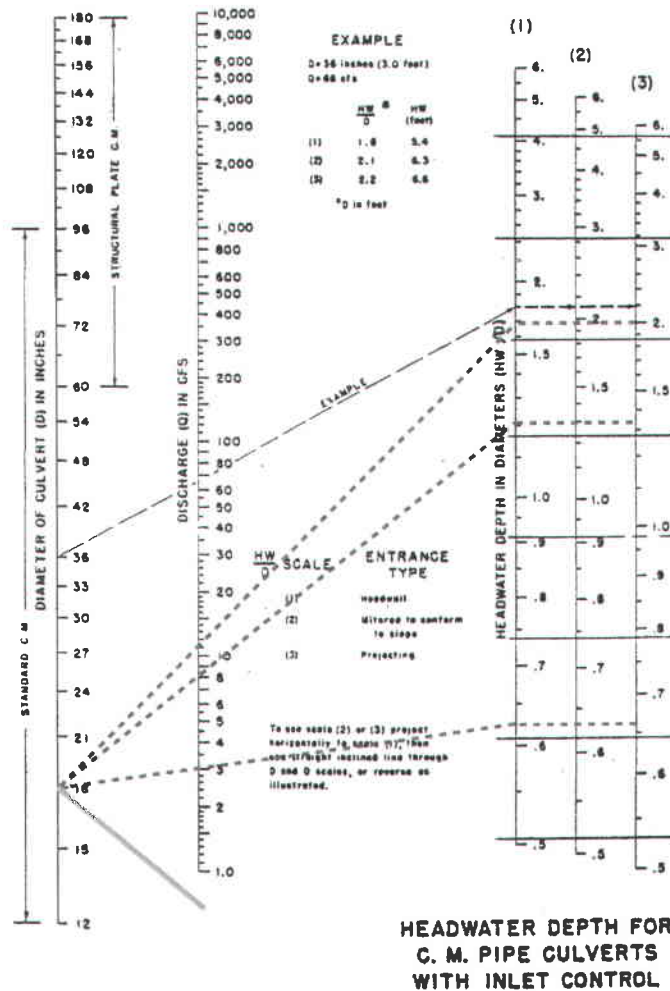
(From Ref. Hyd. Eng. Circular No. 5, USBRP, 1965)

HEC-HMS HYDROLOGIC MODEL

Due to the limited printing capability of the public version of HEC-HMS, screen images of the HEC-HMS input and output are presented along with subbasin hydrologic parameters used in the model. The watershed and subbasin information is based on the Reclamation Phase since it results in higher peak flows and total runoff than the hydrology of the Operations Phase. The drainage areas are shown on *Pond No. 8, Plan View and Drainage Map, Reclamation Phase* in *Appendix VI-7*. Pond No. 8 was sized using a 100-year, 6-hour storm input to an HEC-1 computer model presented in *Appendix VI-7 – Sediment Pond No. 8*. The drainage areas represent the watershed during the Operations Phase. Text has been added to the Pond 8 design to show the pond is capable of containing and treating the runoff during the Reclamation Phase also.

Ditch No. 2 intercepts and conveys drainage from the Stockpile/Disposal Site. Per Utah regulations, the structure is designed to handle the 100-year, 6-hour storm event. Total rainfall for the 100-year, 6-hour storm is 1.80 inches. The same rainfall distribution used in the original HEC-1 model is used in this HEC-HMS model. A computational time interval of one minute was used due to the small lag times in the subbasins.

Refuse Area HEC-HMS Network Diagram:
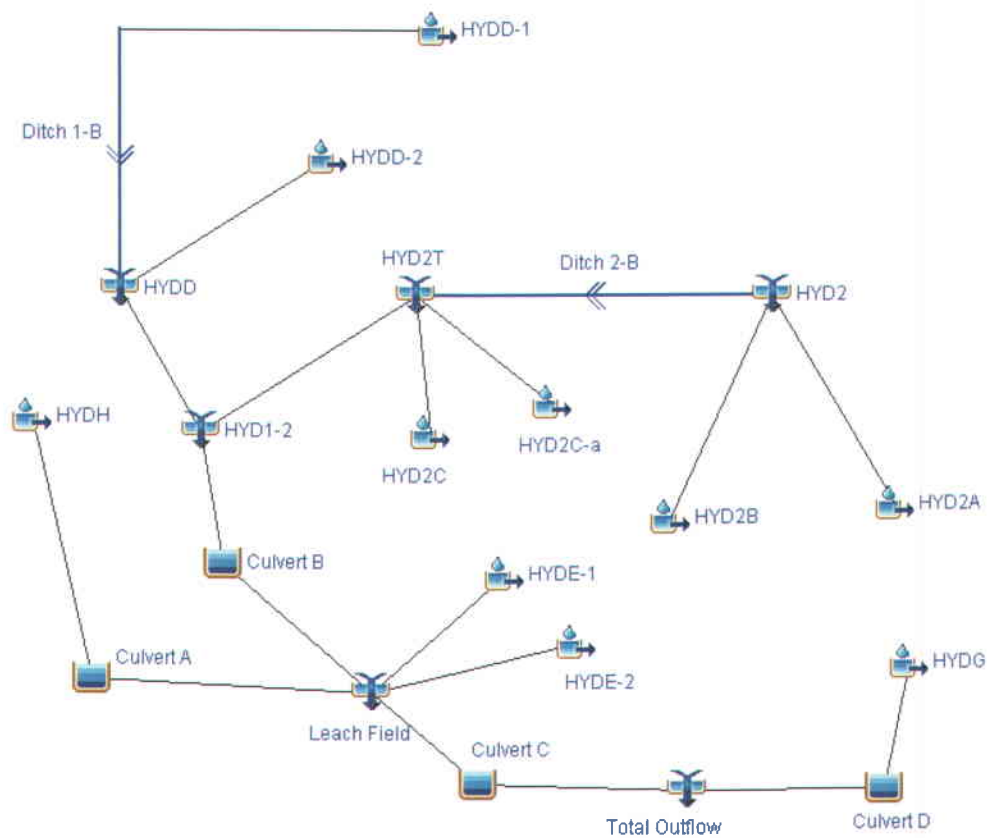
Subbasin Hydrology:

Description of Subbasins:

HYD2A   Unaffected area east of Stockpile/Disposal Site and affected area from
             Permanent Waste Disposal Site (Area A)

HYD2B   Stockpile/Disposal Site, east and north out slopes (Area B)

HYD2C-a   Top of Pile (Area C)

HYD2C   Remaining Stockpile/Disposal Site and area west of pile (Area C)

HYDD-1   Unaffected area north of Stockpile/Disposal Site (Area D)

HYDD-2   Affected area west of Ditch 2B (Area D)

HYDE-1   Unaffected area south of existing waste disposal pile and the affected
             Permanent Waste Disposal Site (Area E)

HYDE-2   Unaffected area north of and including existing leach field (Area E)

HYDH   Road drainage area

HYDG   Unaffected area north of facility area

Subbasin Parameters:

Subbasin ID	Area (ac)	Area (mi²)	CN	S	L (ft)	Y (%)	l_T (min)
HYD2A	1.3	0.0020	85	1.76	250	15	1.4
HYD2B	0.7	0.0011	90	1.11	80	30	0.3
HYD2C-a	0.5	0.0008	90	1.11	60	1	1.4
HYD2C	3.7	0.0058	90	1.11	600	5	4.0
HYDD-1	0.5	0.0008	80	2.50	60	10	0.6
HYDD-2	0.6	0.0009	80	2.50	35	25	0.3
HYDE-1	6.8	0.0106	85	1.76	950	10	4.9
HYDE-2	2.7	0.0042	80	2.50	300	20	1.6
HYDH	0.8	0.0013	90	1.11	750	3	6.1
HYDG	0.6	0.0009	80	2.50	150	50	0.6

CN = SCS Curve Number

S = $(1000/CN) - 10$

L = Hydraulic Length of Watershed

Y = Average land slope

l_T = SCS lag time in hours = $(L^{0.8} (S + 1)^{0.7})/(1900 Y^{0.5})$

Ditch Geometry:

Ditch ID	Length (ft)	Bottom (ft)	Side Slope (xH:1V)	Flow Gradient (ft V:1 ft H)	Manning's "n"	Lining
Ditch 2A	670	2	2	0.0425	0.030	Earthen
Ditch 2B	600	2	2	0.0068	0.030	Earthen
Ditch 2C	120	3	2	0.0292	0.030	Rock
Ditch 1A	495	0	4	0.0480	0.030	Earthen
Ditch 1B	595	0	4	0.0090	0.030	Earthen

Not all ditches were included in the HEC-HMS model.

A small rock-lined channel at the end of Ditch 2B was not modeled. The channel conveys flow from Ditch 2B to Ditch 2C.

Outflow from Culverts A and B and runoff from Area E pass through the existing leach field before entering Culvert C. A cross section of the leach field is shown on page 27P of this appendix.

The drainage areas shown on the *Pond No. 8 Plan View and Drainage Map, Operations Phase* are valid during the operation of Emery Mine. At the end of operations, the material in the Coal Mine Waste Disposal Site will be transported to the Permanent Development Waste Disposal Site. Drainage areas will change slightly at that time due to changing topography. Runoff from the Permanent Development Waste Disposal Site during the reclamation phase will report to Pond No. 8.

HEC-HMS Output:

Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYD2A

Start of Run :   01Jul2007, 00:00
End of Run :   02Jul2007, 00:00
Compute Time : 01Feb2008, 15:59:36

Basin Model :   Total Perm Refuse
Meteorologic Model :   100-yr 6-hr
Control Specifications : Control 1

Volume Units : ○ IN ◉ AC-FT

Computed Results

Peak Discharge :   1.92 (CFS)
Total Precipitation : 0.19 (AC-FT)
Total Loss :   0.12 (AC-FT)
Total Excess :   0.07 (AC-FT)

Date/Time of Peak Discharge : 01Jul2007, 03:00
Total Direct Runoff :   0.07 (AC-FT)
Total Baseflow :   0.00 (AC-FT)
Discharge :   0.07 (AC-FT)

[Print]   [Close]

Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYD2B

Start of Run :   01Jul2007, 00:00
End of Run :   02Jul2007, 00:00
Compute Time : 01Feb2008, 15:59:36

Basin Model :   Total Perm Refuse
Meteorologic Model :   100-yr 6-hr
Control Specifications : Control 1

Volume Units : ◉ IN ○ AC-FT

Computed Results

Peak Discharge :   1.41 (CFS)
Total Precipitation : 1.80 (IN)
Total Loss :   0.87 (IN)
Total Excess :   0.93 (IN)

Date/Time of Peak Discharge : 01Jul2007, 03:00
Total Direct Runoff :   0.93 (IN)
Total Baseflow :   0.00 (IN)
Discharge :   0.93 (IN)

[Print]   [Close]

Project : Emery   Simulation Run : Total Perm Refuse   Junction: HYD2

Start of Run :   01Jul2007, 00:00
End of Run :   02Jul2007, 00:00
Compute Time : 01Feb2008, 15:59:36

Basin Model :   Total Perm Refuse
Meteorologic Model :   100-yr 6-hr
Control Specifications : Control 1

Volume Units : ○ IN ◉ AC-FT

Computed Results

Peak Outflow : 3.34 (CFS)
Total Outflow : 0.12 (AC-FT)

Date/Time of Peak Outflow : 01Jul2007, 03:00

[Print]   [Close]

HEC-HMS Output (continued):

Project : Emery   Simulation Run : Total Perm Refuse   Reach: Ditch 2-B

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units : ◯ IN ◉ AC-FT

Computed Results

Peak Inflow :   3.34 (CFS)   Date/Time of Peak Inflow :   01Jul2007, 03:00
Peak Outflow : 3.20 (CFS)   Date/Time of Peak Outflow : 01Jul2007, 03:02
Total Inflow :   0.12 (AC-FT)   Total Outflow :   0.12 (AC-FT)

Print   Close

Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYD2C-a

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units : ◯ IN ◉ AC-FT

Computed Results

Peak Discharge :   1.01 (CFS)   Date/Time of Peak Discharge : 01Jul2007, 03:00
Total Precipitation : 0.08 (AC-FT)   Total Direct Runoff :   0.04 (AC-FT)
Total Loss :   0.04 (AC-FT)   Total Baseflow :   0.00 (AC-FT)
Total Excess :   0.04 (AC-FT)   Discharge :   0.04 (AC-FT)

Print   Close

Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYD2C

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units : ◯ IN ◉ AC-FT

Computed Results

Peak Discharge :   6.83 (CFS)   Date/Time of Peak Discharge : 01Jul2007, 03:01
Total Precipitation : 0.56 (AC-FT)   Total Direct Runoff :   0.29 (AC-FT)
Total Loss :   0.27 (AC-FT)   Total Baseflow :   0.00 (AC-FT)
Total Excess :   0.29 (AC-FT)   Discharge :   0.29 (AC-FT)

Print   Close

HEC-HMS Output (continued):

Project : Emery   Simulation Run : Total Perm Refuse   Junction: HYD2T

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units :   ○ IN ◉ AC-FT

Computed Results

Peak Outflow : 10.85 (CFS)   Date/Time of Peak Outflow : 01Jul2007, 03:00
Total Outflow : 0.45 (AC-FT)

Print   Close

Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYDD-1

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units :   ○ IN ◉ AC-FT

Computed Results

Peak Discharge :   0.58 (CFS)   Date/Time of Peak Discharge : 01Jul2007, 03:00
Total Precipitation : 0.08 (AC-FT)   Total Direct Runoff :   0.02 (AC-FT)
Total Loss :   0.06 (AC-FT)   Total Baseflow :   0.00 (AC-FT)
Total Excess :   0.02 (AC-FT)   Discharge :   0.02 (AC-FT)

Print   Close

Project : Emery   Simulation Run : Total Perm Refuse   Reach: Ditch 1-B

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units :   ○ IN ◉ AC-FT

Computed Results

Peak Inflow :   0.58 (CFS)   Date/Time of Peak Inflow :   01Jul2007, 03:00
Peak Outflow : 0.54 (CFS)   Date/Time of Peak Outflow : 01Jul2007, 03:04
Total Inflow : 0.02 (AC-FT)   Total Outflow :   0.02 (AC-FT)

Print   Close

HEC-HMS Output (continued):

Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYDD-2

Start of Run :	01Jul2007, 00:00	Basin Model : Total Perm Refuse
End of Run :	02Jul2007, 00:00	Meteorologic Model : 100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36		Control Specifications : Control 1

Volume Units : ◯ IN ⦿ AC-FT

Computed Results

Peak Discharge :	0.66 (CFS)	Date/Time of Peak Discharge : 01Jul2007, 03:00	
Total Precipitation : 0.09 (AC-FT)		Total Direct Runoff :	0.02 (AC-FT)
Total Loss :	0.07 (AC-FT)	Total Baseflow :	0.00 (AC-FT)
Total Excess :	0.02 (AC-FT)	Discharge :	0.02 (AC-FT)

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Project : Emery   Simulation Run : Total Perm Refuse   Junction: HYDD

Start of Run :	01Jul2007, 00:00	Basin Model : Total Perm Refuse
End of Run :	02Jul2007, 00:00	Meteorologic Model : 100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36		Control Specifications : Control 1

Volume Units : ◯ IN ⦿ AC-FT

Computed Results

Peak Outflow : 1.08 (CFS)   Date/Time of Peak Outflow : 01Jul2007, 03:00
Total Outflow : 0.04 (AC-FT)

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Project : Emery   Simulation Run : Total Perm Refuse   Junction: HYD1-2

Start of Run :	01Jul2007, 00:00	Basin Model : Total Perm Refuse
End of Run :	02Jul2007, 00:00	Meteorologic Model : 100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36		Control Specifications : Control 1

Volume Units : ◯ IN ⦿ AC-FT

Computed Results

Peak Outflow : 11.93 (CFS)   Date/Time of Peak Outflow : 01Jul2007, 03:00
Total Outflow : 0.49 (AC-FT)

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HEC-HMS Output (continued):

Project : Emery   Simulation Run : Total Perm Refuse   Reservoir: Culvert B

Start of Run :   01Jul2007, 00:00
End of Run :   02Jul2007, 00:00
Compute Time : 01Feb2008, 15:59:36

Basin Model :   Total Perm Refuse
Meteorologic Model :   100-yr 6-hr
Control Specifications : Control 1

Volume Units :   ◯ IN   ⦿ AC-FT

Computed Results

Peak Inflow :   11.93 (CFS)
Peak Outflow : 11.71 (CFS)
Total Inflow :   0.49 (AC-FT)
Total Outflow : 0.49 (AC-FT)

Date/Time of Peak Inflow :   01Jul2007, 03:00
Date/Time of Peak Outflow : 01Jul2007, 03:01
Peak Storage :   0.01 (AC-FT)
Peak Elevation :   941.57 (FT)

[Print]   [Close]

Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYDH

Start of Run :   01Jul2007, 00:00
End of Run :   02Jul2007, 00:00
Compute Time : 01Feb2008, 15:59:36

Basin Model :   Total Perm Refuse
Meteorologic Model :   100-yr 6-hr
Control Specifications : Control 1

Volume Units :   ◯ IN   ⦿ AC-FT

Computed Results

Peak Discharge :   1.43 (CFS)
Total Precipitation : 0.12 (AC-FT)
Total Loss :   0.06 (AC-FT)
Total Excess :   0.06 (AC-FT)

Date/Time of Peak Discharge : 01Jul2007, 03:02
Total Direct Runoff :   0.06 (AC-FT)
Total Baseflow :   0.00 (AC-FT)
Discharge :   0.06 (AC-FT)

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Project : Emery   Simulation Run : Total Perm Refuse   Reservoir: Culvert A

Start of Run :   01Jul2007, 00:00
End of Run :   02Jul2007, 00:00
Compute Time : 01Feb2008, 15:59:36

Basin Model :   Total Perm Refuse
Meteorologic Model :   100-yr 6-hr
Control Specifications : Control 1

Volume Units :   ◯ IN   ⦿ AC-FT

Computed Results

Peak Inflow :   1.43 (CFS)
Peak Outflow : 1.42 (CFS)
Total Inflow :   0.06 (AC-FT)
Total Outflow : 0.06 (AC-FT)

Date/Time of Peak Inflow :   01Jul2007, 03:02
Date/Time of Peak Outflow : 01Jul2007, 03:03
Peak Storage :   0.00 (AC-FT)
Peak Elevation :   933.47 (FT)

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HEC-HMS Output (continued):

Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYDE-1

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units : ◯ IN ◉ AC-FT

Computed Results

Peak Discharge :   8.83 (CFS)   Date/Time of Peak Discharge : 01Jul2007, 03:02
Total Precipitation : 1.02 (AC-FT)   Total Direct Runoff :   0.37 (AC-FT)
Total Loss :   0.65 (AC-FT)   Total Baseflow :   0.00 (AC-FT)
Total Excess :   0.37 (AC-FT)   Discharge :   0.37 (AC-FT)

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Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYDE-2

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units : ◯ IN ◉ AC-FT

Computed Results

Peak Discharge :   2.88 (CFS)   Date/Time of Peak Discharge : 01Jul2007, 03:00
Total Precipitation : 0.40 (AC-FT)   Total Direct Runoff :   0.10 (AC-FT)
Total Loss :   0.30 (AC-FT)   Total Baseflow :   0.00 (AC-FT)
Total Excess :   0.10 (AC-FT)   Discharge :   0.10 (AC-FT)

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Project : Emery   Simulation Run : Total Perm Refuse   Junction: Leach Field

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units : ◯ IN ◉ AC-FT

Computed Results

Peak Outflow : 24.50 (CFS)   Date/Time of Peak Outflow : 01Jul2007, 03:01
Total Outflow : 1.02 (AC-FT)

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HEC-HMS Output (continued):

```
   Project : Emery   Simulation Run : Total Perm Refuse   Reservoir: Culvert C

Start of Run :   01Jul2007, 00:00        Basin Model :           Total Perm Refuse
End of Run :     02Jul2007, 00:00        Meteorologic Model :    100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36       Control Specifications : Control 1

                    Volume Units :   ◯ IN   ⦿ AC-FT

  Computed Results

    Peak Inflow :   24.50 (CFS)      Date/Time of Peak Inflow :  01Jul2007, 03:01
    Peak Outflow : 16.20 (CFS)       Date/Time of Peak Outflow : 01Jul2007, 03:05
    Total Inflow :   1.02 (AC-FT)    Peak Storage :              0.19 (AC-FT)
    Total Outflow : 1.02 (AC-FT)     Peak Elevation :            929.23 (FT)


                                          [ Print ]    [ Close ]
```

```
     Project : Emery   Simulation Run : Total Perm Refuse   Subbasin: HYDG

Start of Run :   01Jul2007, 00:00        Basin Model :           Total Perm Refuse
End of Run :     02Jul2007, 00:00        Meteorologic Model :    100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36       Control Specifications : Control 1

                    Volume Units :   ◯ IN   ⦿ AC-FT

  Computed Results

    Peak Discharge :     0.65 (CFS)      Date/Time of Peak Discharge : 01Jul2007, 03:00
    Total Precipitation : 0.09 (AC-FT)   Total Direct Runoff :         0.02 (AC-FT)
    Total Loss :         0.07 (AC-FT)    Total Baseflow :              0.00 (AC-FT)
    Total Excess :       0.02 (AC-FT)    Discharge :                   0.02 (AC-FT)


                                          [ Print ]    [ Close ]
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```
   Project : Emery   Simulation Run : Total Perm Refuse   Reservoir: Culvert D

Start of Run :   01Jul2007, 00:00        Basin Model :           Total Perm Refuse
End of Run :     02Jul2007, 00:00        Meteorologic Model :    100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36       Control Specifications : Control 1

                    Volume Units :   ◯ IN   ⦿ AC-FT

  Computed Results

    Peak Inflow :   0.65 (CFS)       Date/Time of Peak Inflow :  01Jul2007, 03:00
    Peak Outflow : 0.63 (CFS)        Date/Time of Peak Outflow : 01Jul2007, 03:00
    Total Inflow :   0.02 (AC-FT)    Peak Storage :              0.00 (AC-FT)
    Total Outflow : 0.02 (AC-FT)     Peak Elevation :            924.81 (FT)


                                          [ Print ]    [ Close ]
```

HEC-HMS Output (continued):

Project : Emery   Simulation Run : Total Perm Refuse   Junction: Total Outflow

Start of Run :   01Jul2007, 00:00   Basin Model :   Total Perm Refuse
End of Run :   02Jul2007, 00:00   Meteorologic Model :   100-yr 6-hr
Compute Time : 01Feb2008, 15:59:36   Control Specifications : Control 1

Volume Units :   ○ IN   ● AC-FT

Computed Results

Peak Outflow : 16.32 (CFS)   Date/Time of Peak Outflow : 01Jul2007, 03:05
Total Outflow : 1.04 (AC-FT)

[Print]   [Close]

Summary of HEC-HMS results:

Project: Emery   Simulation Run: Total Perm Refuse

Start of Run: 01Jul2007, 00:00   Basin Model: Total Perm Refuse
End of Run: 02Jul2007, 00:00   Meteorologic Model: 100-yr 6-hr
Compute Time: 01Feb2008, 15:59:36   Control Specifications: Control 1

Volume Units: ● IN   ○ AC-FT

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Culvert A	0.0013	1.42	01Jul2007, 03:03	0.93
Culvert B	0.0114	11.71	01Jul2007, 03:01	0.81
Culvert C	0.0275	16.20	01Jul2007, 03:05	0.70
Culvert D	0.0009	0.63	01Jul2007, 03:00	0.44
Ditch 1-B	0.0008	0.54	01Jul2007, 03:04	0.45
Ditch 2-B	0.0031	3.20	01Jul2007, 03:02	0.75
HYD1-2	0.0114	11.93	01Jul2007, 03:00	0.81
HYD2	0.0031	3.34	01Jul2007, 03:00	0.75
HYD2A	0.0020	1.92	01Jul2007, 03:00	0.65
HYD2B	0.0011	1.41	01Jul2007, 03:00	0.93
HYD2C	0.0058	6.83	01Jul2007, 03:01	0.93
HYD2C-a	0.0008	1.01	01Jul2007, 03:00	0.93
HYD2T	0.0097	10.85	01Jul2007, 03:00	0.87
HYDD	0.0017	1.08	01Jul2007, 03:00	0.45
HYDD-1	0.0008	0.58	01Jul2007, 03:00	0.44
HYDD-2	0.0009	0.66	01Jul2007, 03:00	0.44
HYDE-1	0.0106	8.83	01Jul2007, 03:02	0.65
HYDE-2	0.0042	2.88	01Jul2007, 03:00	0.44
HYDG	0.0009	0.65	01Jul2007, 03:00	0.44
HYDH	0.0013	1.43	01Jul2007, 03:02	0.93
Leach Field	0.0275	24.50	01Jul2007, 03:01	0.70
Total Outflow	0.0284	16.32	01Jul2007, 03:05	0.69

[Print]   [Close]

Summary of Ditch Flows:

Ditch	Peak Flow (cfs)	Peak Flow Depth (ft)	Peak Velocity (fps)
Ditch 2-A	3.3	0.3	4.0
Ditch 2-B	10.8	1.0	2.9
Ditch 1-A	0.6	0.3	2.6
Ditch 1-B	1.1	0.4	1.6
Ditch 2-C	11.9	0.6	4.9

Drainage off the top of the pile (HYD2C-a) was included in the HMS model. Peak runoff for the 100-year event is 1.0 cfs. Runoff is directed away from the outside slopes on the east and north sides and toward the southwest along the access road. The slope gradient along the access road is about 15%. A 1-foot wide ditch to convey this runoff down the slope would only flow 0.16 feet deep. Therefore, runoff controls are not necessary for this area and a ditch design is not proposed.

The road ditch on the west of and parallel to Ditch 1B conveys drainage from the road south to Culvert A. This ditch and culvert do not carry refuse area drainage and, therefore, do not need to be designed for the 100-year, 6-hour precipitation event. However, Area H and Culvert A were included in the HMS model since their runoff reports to Culvert C and Pond No. 8. Culvert A is adequate to convey drainage for the 100-year event without overtopping the road.
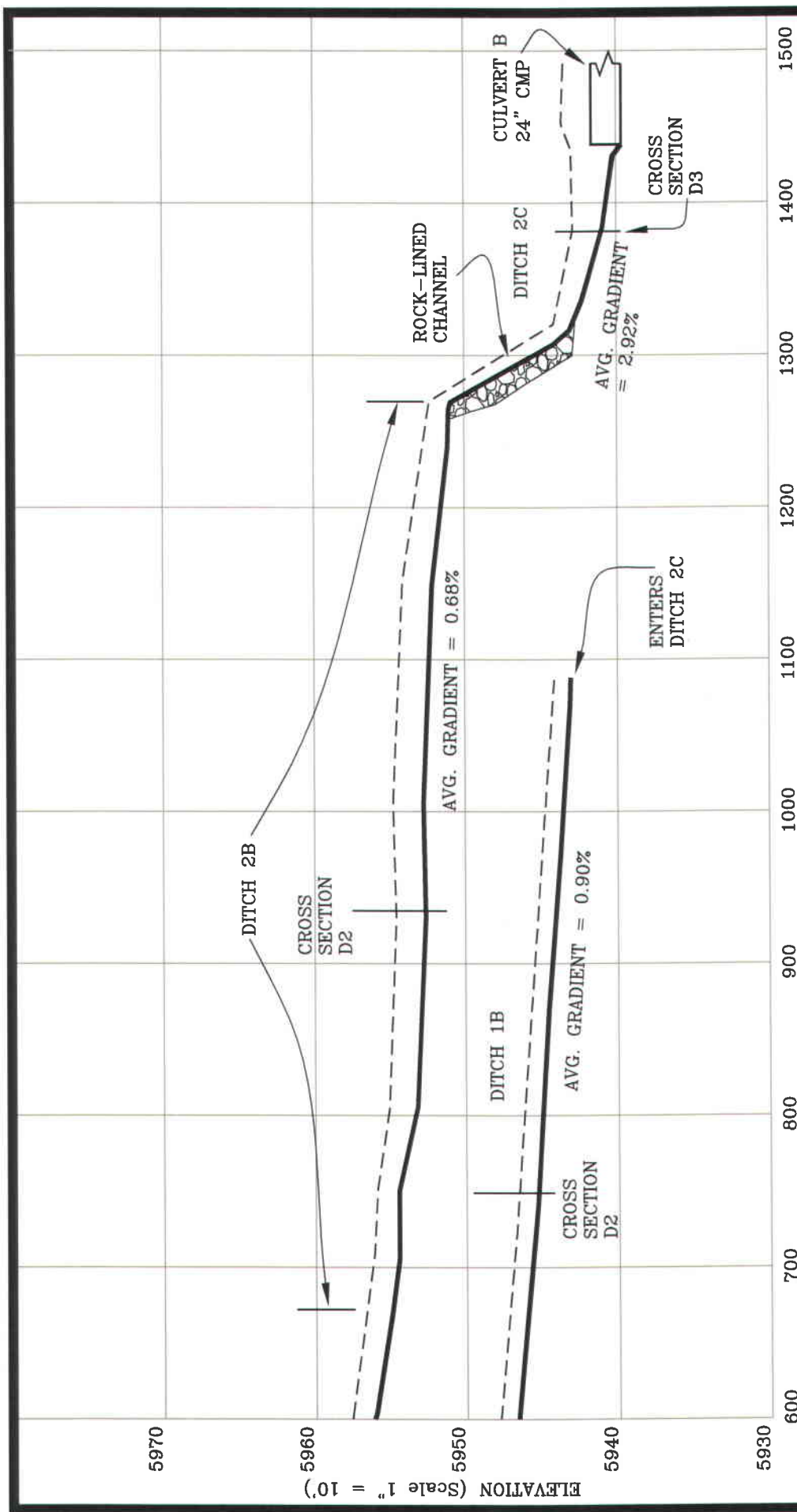
FLOWLINE PROFILE
TEMP. DITCH NO. 1 & 2
Sheet 1 of 2

Emery Mine

| Permit No. ACT 015/015 | | | Drawn By: MWS | Figure VI-27 |
| Project No. C-07182 | Date 2/08 | Scale AS SHOWN | | |

DISTANCE (Scale 1" = 100')

ELEVATION (Scale 1" = 10')

5980
5970
5960
5950
5940

0 100 200 300 400 500 600 700 800 900

DITCH 2A

AVG. GRADIENT = 4.25%

CROSS SECTION D1

DITCH 1A

AVG. GRADIENT = 4.81%

CROSS SECTION D1

NATURAL DRAINAGE CHANNEL

EXCAVATED DITCH

DITCH 1B

AVG. GRADIENT = 0.90%

Appendix VI-6
Inserted 2/08

FLOWLINE PROFILE
TEMP. DITCH NO. 1 & 2
Sheet 2 of 2

Emery Mine

Permit No. ACT 015/015		
		Drawn By: MWS
Project No. C-07182	Date 2/08	Scale AS SHOWN
		Figure VI-27A

NPN ENVIRONMENTAL

Appendix VI-6
Inserted 2/08

CROSS SECTION
D3 – D3'

DITCH 2C

3' BOTTOM
(BEDROCK)

1
2

1
2

ROAD
DITCH

DISTANCE (FT)

40

30

20

10

5945

5940

5935

CROSS SECTION
D1 – D1'

DITCH 2A

1
2

2' BOTTOM

1
2

1
4

BOTTOM WIDTH VARIES
FROM 0 – 1.5'

DITCH 1A
(NATURAL
DRAINWAY)

1
4

DISTANCE (FT)

0

10

20

30

40

5960

5955

CROSS SECTION
D2 – D2'

1
4

2' BOTTOM

1
2

1
2

DITCH 2B

1
4

BOTTOM WIDTH VARIES
FROM 0 – 1.5'

DITCH 1B

1
4

DISTANCE (FT)

0

10

20

30

40

50

5955

5950

5945

LOCATION OF CROSS SECTIONS
SHOWN ON "POND NO. 8 PLAN
VIEW AND DRAINAGE MAP"

Appendix VI-6

Inserted 2/08

CROSS SECTION
D4 — D4'

LEACH FIELD

ROAD

ELEVATION

5935

5930

5925

DISTANCE (FT)

0   20   40   60   80   100   120   140

CROSS SECTION
LEACH FIELD

Emery Mine

Permit No. ACT 015/015

Project No.
C-07182

Date
2/08

Scale
AS SHOWN

Drawn By:
MWS

Figure
VI-27C

LOCATION OF CROSS SECTIONS
SHOWN ON "POND NO. 8 PLAN
VIEW AND DRAINAGE MAP,
OPERATIONS PHASE
&RECLAMATION PHASE"

NPN
ENVIRONMENTAL

Appendix VI-6
Inserted 2/08

Proposed Pond No. 8 will be located just west of the mine office buildings in a depression area that is currently called Catch Basin "A". This depression area has functioned effectively as a sediment control feature for several years and will continue to perform sufficiently as a sediment pond. Surface water runoff from the mine yard and coal stockpile area, adjacent to and north of the mine office, is directed into Pond No. 8 by the drainage control berms and by 24-inch and 18-inch~~proposed 18 inch CMP~~ culverts through the mine entrance road.

During the Operations Phase, Pond No. 8 has a drainage area of 20.3 acres. The dewatering system will consist of an 8 inch pipe with a dewatering valve at the outlet end. Based on the relatively large storage capacity of this pond, no emergency spillway will be necessary. The pond is fully capable of containing runoff from a 100 year/6 hour event while providing over 3 feet of freeboard. The design calculations shown on pages 52A through 52J are applicable during the Operations Phase.

In the future, a portion of Pond No. 8 will be filled in order to expand the mine office parking area to the west. The fill material will consist of excess cut material obtained from the proposed waste disposal site, located just north of the mine yard area. In the following design calculations for Pond No. 8, the fill volume required to expand the proposed parking area is subtracted from the pond storage volume.

During the Reclamation Phase when the temporary Coal Mine Waste Disposal Site material is transferred to the Permanent Development Waste Disposal Site, the drainage area to Pond No. 8 will increase to 21.8 acres. Pages 52K through 52M show the pond is also adequately sized for the Reclamation Phase.

POND NO. 8
RECLAMATION PHASE

During the Reclamation Phase at the end of mine operations, drainage area for Pond No. 8 will increase slightly from 20.3 acres to 21.8 acres due to the addition of the Permanent Development Waste Disposal Site as shown on *Pond No. 8, Plan View and Drainage Map, Reclamation Phase*. Most of the hydrologic and hydraulic parameters will remain the same as the Operations Phase design on pages 52A through 52J. The following information is presented to verify the pond is adequate for the increased acreage during the Reclamation Phase.

Hydrologic Information

Drainage Area:	21.8 acres or 0.034 mi^2
Storm Type:	SCS Type II
Hydrologic Curve Number:	86
Design Event – Normal Pool:	10-year/24-hour (1.7 inches)
Design Event – Spillway:	100-year/6-hour (1.8 inches)

Runoff Characteristics and Direct Runoff will be similar to Operations Phase

Weighted CN = 86
Direct Runoff (10-year/24-hour) = 0.63 inches

Total Runoff Volume = V_t (10-year/24-hour)

$$V_t = \frac{(21.8\,ac)\,(0.63\,inches)}{12\,in/ft} = 1.14\,ac\text{-}ft$$

Sediment Storage Volume

Assume Sediment Yield rate same as Operations Phase at 7.37 tons/ac-yr
Total Sediment Yield = (7.37 tons/ac-yr) (21.8 ac) (5 yr) = 803.3 tons

Weighted Sediment Density = 62.2 lb/cu ft

$$\text{Total Sediment Volume} = (803.3\,tons)\,\frac{(2000\,lb)}{ton}\,\frac{(ft^3)}{62.2\,lb}\,\frac{(ac)}{43{,}560\,ft^2}$$

= 0.59 ac-ft/5 years
= 0.12 ac-ft/year

Total Sediment Storage

From pages 52C and 52D:
Total Sediment Storage = 2.00 ac-ft
   (Elevation 5910)

Maximum Allowable Sediment Storage = 1.35 ac-ft
   (Elevation 5909, 1 foot below pipe discharge)

Therefore, adequate sediment storage is provided for a 5-year period. At an annual sediment accumulation rate of 0.12 ac-ft/year, the cleanout interval will be approximately 11.3 years.

Design Pool Information

Design Pool Volume = Total Sediment Storage + Total Runoff Volume
   = 2.00 ac-ft + 1.14 ac-ft
   = 3.14 ac-ft

From Stage vs. Storage Curve on page 52E,
Peak Pool Elevation (10-year/24-hour) = 5911.5 ft

Design Verification (100-year/6-hour event)

Direct Runoff for 100-year/6-hour is 0.70 inches

Direct Runoff Volume (100-year/6-hour)

$$V_t = \frac{(21.8\,ac)\,(0.70\,inches)}{12\,in/ft} = 1.27\,ac\text{-}ft$$

Peak Pool Volume = Total Sediment Storage + Total Runoff Volume
   = 2.00 ac-ft + 1.27 ac-ft
   = 3.27 ac-ft

From Stage vs. Storage Curve on page 52E,
Peak Pool Elevation (100-year/6-hour) = 5911.7 ft

Dam Crest = 5915 feet; therefore, freeboard is 3.3 feet for the 100-year/6-hour event. Pond No. 8 is adequately sized to fully contain runoff from the 100-year, 6-hour event during the Reclamation Phase.